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# FARMERS DIGEST

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# The Farmer's Digest


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The Farmer's Digest

Volume 7 February, 1944 Number 9

# Why Do Farmers Plow?

Reprinted from Better Crops With Plant Food

*Wm. A. Albrecht*

Department of Soils, University of Missouri, Columbia, Missouri

THAT is "an easy question to answer" for the farmers who know how to plow and who "like to plow." They are legion who "get pleasure out of seeing the soil turn turtle," and who will tell you that they plow to improve their crops in quantity and in quality. To fly into the face of the testimony which is the observation of the myriads of tillers of the soil during the ages past, and to deny that there is any scientific basis for this practice, even if it is not known by the farmers, will demand strong and sound evidence.

Without doubt, we have been doing too much plowing, but there is a background of birthright and history for it. North European origin and ancestry, so common in the United States, bring plowing into the foreground as a tillage habit to aerate and warm the heavily textured soils of that climatic region. Farming demanded plowing, and one doesn't make a living without plowing on a farm that is of clay loam or clay texture, and under liberal and regular rainfall. Areas of older agriculture have survived because of heavy soils. Agriculture on sandy soils has been fleeting. Farmers from these older agricultural sections couldn't conceive of farming without plowing. To them, as to the majority of us, the plow has always been the symbol of agriculture.

Plowing without understanding its functions in relation to the soil and the soil fertility, however, now demonstrates that we have done too much plowing — and much unnecessary plowing. There is the inclination in this confession to condemn the very practice itself. We have been too prone to treat all soils, regardless of texture and structure, to the same frequency of plowing. We are just now examining this, at least from the viewpoint of economy.

During the importation of the

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plowing idea and the application of the practice in the United States, our ancestors did not recognize their transition to soils that are mainly silt loams, that demand less plowing than European clay loams. They failed to appreciate the connection plowing might have with their movement from regions where the rainfall comes regularly in small showers to those where a large share of the rains are torrential. This failure was more serious in our westward trek to central United States, where the relative torrential nature increases as total rainfall diminishes. This shift from maritime to continental climate was not appreciated until much plowing under torrential downpours put erosion of almost catastrophic magnitude over our most productive areas.

Our ancestors—and we, like them—failed to recognize also that in moving some 700 or more miles southward, one is going toward increasing continentality with its higher and more fluctuating temperatures. Here is the biological aspect of the rapid rate with which the reserve organic matter in the soil has been burned out. This was the basis of the high crop yields enjoyed by the pioneer for his much plowing. These yields were purchased at tremendous soil fertility costs, and this almost explosive exhaustion of the soil organic matter in our brief history has left the soil less receptive to the heavier rainfall, has encouraged greater runoff, and has brought with it the damaging erosion. Excessive tillage by plow and otherwise has not yet brought us to appreciate that it has also exhausted from the cultivated soils the very plant nutrients that now prohibit nature from quickly growing the vegetation that would cover her nakedness and reduce the erosion hazard.

Yes, we have plowed too much, as our hindsight forcefully tells us. But surely our foresight is better than to allow refusal to plow in the future.

Plowing does aerate the soil, as any soil microbiologist will testify. As a consequence of the change of atmosphere in the soil and because of the stirring by the moldboard plow, there is new "life." The soil is a factory in which much energy is expended. It is transforming many substances, oxidizing or burning tons of carbon to carbon dioxide, sulfur to sulfur dioxide, ammonia to nitrate, and other similar combustions. These important facts are disregarded as part of the soil's contribution to production of crops by him who would not plow.

When a 40-acre corn field under maximum growing activity in July is burning to form carbon dioxide the carbon equivalent of that used in running a steam

engine of 40 horsepower, can any one deny the necessity of air for such a performance? Surely no one will close the draft and destroy such producing power by refusing to plow.

Air in the soil is not wholly a matter of the shifting water table, as soil science of the vintage of 1910 suggests. Water tables are located at extreme depths. This has been revealed by the numerous studies encouraging soil conservation because it is a practice in water conservation. These depth figures are so large as to be ample evidence that fluctuations of the water tables, even over wide range so far down in the soil profile, could mean nothing in the way of atmospheric air exchange with that in the surface soil.

Then, too, water can move up and down in the soil without moving as a whole water table. It can move without necessarily exchanging air within the soil for that in the atmosphere above it, much as water in the lower half of a bottle can exchange place with the air above it as the bottle is inverted, but yet remains tightly stoppered. Just as atmospheric air plays no role in this exchange of places by water and air in the bottle, just so can water move in the soil and air can move in the opposite direction, without atmospheric air entering.

Then, too, oxidations can occur in the soil in the absence of atmosphere. Chemical compounds of oxygen in the soil give up this element to supply it for various functions. It serves to burn substances in the soil just as saltpeter mixed with charcoal burns the mixture with a speed explosive enough to be gunpowder. Atmospheric burning of charcoal is too slow to make it serve as explosive.

The burning business in the soil by means of oxygen from the air or from chemical combustions serving in microbial respiration must go on if the plant nutrients tied up in combination with carbon are to be released for repeated use by other plants of succeeding generations. Were this performance not proceeding in the soil, life on the globe would soon become extinct. The soil's producing power would soon be expended. All of its chemical nutrients for sustenance of life, or its soil fertility, would be in combination in its own products of growth above the soil. As a result, the soil could offer nothing and no growth could occur. These fires of oxidation, because of microbial life and activities within the soil, undo these growth products and let the elements make the cycle of growth, death, and decay again. The plow is a means of giving extra draft to hasten this cycle. Shall we prohibit this cycle by refusing to plow?

That plowing improves the efficiency of the soil, not only for oxidation of carbon but also as a nitrogen oxidizing factory to deliver this latter element in the form of available nitrates, is known to those familiar with the more recent developments in soil science. The soil's supply of soluble nitrogen increases during the early growing season as the temperature rises. It may rise to a very high point in fallow soil, or may be consumed by vegetation. It may be leached out by rainfall. It is low again by fall. It declines with the falling temperature or may be held down by excessive drying.

Some studies of the nitrate supply in the soil under corn during the growing season in three adjoining plots, one unplowed, one plowed, and one plowed and cultivated, tell forcefully that plowing provides a larger supply of soluble nitrogen as nitrates. These were the results also in the absence of the crop and of weeds. Cultivating the soil three times, as corn is commonly handled, provides extra nitrate nitrogen via the soil as the producer of this plant nutrient. Crop yields follow in order of the level of these nitrate supplies. The crop depends on the rate of delivery of the soil fertility.

The farmer may not know that these higher levels of nitrate are the more direct causes of his improved crop yield associated with his making the "soil turn turtle." He plows ahead of the corn planting in order to get a better corn crop. His inability to point out the underlying scientific channels through which the effects of plowing are transmitted to the crop does not put the plow into bad repute in his sight. Surely, the hundreds of corn producers will not suddenly discard so ancient an implement merely because they cannot call to their help this scientific evidence when someone concludes for them that the plow is the cause of increased erosion and other devastation that is so easily associated with it.

Plowing and cropping a soil year after year bring with them declining crop yields. For these one might readily pounce upon the plow as the culprit in the case. But one must not forget that cropping includes one crop above the soil as complex vegetation and another one within the soil as simpler bio-chemical products in microbial operations. Soil plowed out of sod and put to crops such as corn or wheat, continuously, soon runs to bare land. Shall we blame the plow as it turns under trash and crop residues to make the field look clean? To the uninformed, this would seem to be evidence that "backfires into the argument that plowing produces a better environment for plant roots." The de-

clining crop yields, which we have been trying so desperately to bolster up by imported crop substitutes or by new creations of the plant breeder, have other causes than merely the plowing operation. They cannot be explained away by the simple beliefs that "the explosive separation of the soil mass wrecks all capillary connections temporarily;" and that "the organic matter sandwiched in further extends the period of sterility of the soil due to dryness." Such deductions are much outmoded when they still pin all explanation on the movements of soil water.

Sterility of the soil is not always a matter of desiccation. The water factor in plant existence has now been accepted as one under nature's control in quantity. Our attention has gone to plant nutrition as the managerial factor, where with little fertility addition we can do much for the plant, even to its water needs. Water in the soil goes back to the weather about which there is much talk but about which little is done. The factor of soil fertility, or of the nutrition of the plants, is one about which we can do something to give us more and better crops for the weather we have. Crops are as they eat, not as they drink. Fighting the weather is less helpful than fixing the fertility of the soil. Crops are not declining or failing because plowing is drying out the soil.

The forces that push plowed land into bare are not the moldboard plow and the horses or tractor with it; they are the continued removal of soil fertility with little return. They are the gradual exhaustion of the stores of fertility in a soil that must first feed the crop of bacteria within before these life forms can leave something for the crop above. Continued and excessive cropping, along with the product removal, reduce the output of the nutrients left over in soluble form by microbial activity. The microbes merely rework what is given them.

The nitrates, or the available forms of nitrogen, are brought down to a very low level in the soil in June by the wheat crop just before its harvest. Early plowing in July for the next crop starts their accumulation in the soil again and the curve begins to rise. In the stubble soil the nitrates stay low. But when this stubble is plowed in August, this soil-stirring operation starts the nitrate supply upward. Delay in plowing until September lets the growing weeds reduce the nitrate supply in the soil even below that possible in exhaustion by the wheat crop. Here is a reason based on nutritional evidence that explains why late plowing for wheat makes it a poor crop, even when weeds are turned under as

a green manure crop. For wheat, plowing in July makes a better crop, but the same operation in September makes a poorer one. Can we then blame the plow when the same performance in turning the soil is both good and bad for the crop, all within the short time of three months?

The microbial crop comes in for the explanation. The microbes must be fed first. They eat at the first table, the wheat at the second. Early plowing puts under little organic matter. It compels the bacteria to oxidize the humus of the soil that has already been worked over to the point where it has a narrow nutritive ratio, or a small amount of carbon as compared with its nitrogen. When bacteria get their energy, they burn much of the carbon and leave the soluble nitrogen to accumulate in the form of nitrates as nourishment for the wheat, to its better growth.

Late plowing that turns under weeds represents a case of feeding the bacteria with a diet of excessive carbon and of deficient nitrogen. The weeds that grew in the stubble after the wheat had taken most of the nitrogen couldn't be nitrogen-rich. They were carbon-rich or woody. Turned under, this excessive supply of carbon as energy material compels the microbes to use the soil nitrogen to balance their nutritional needs. They put this soluble nitrogen into complex, insoluble combinations resulting from weed decay. The wheat crop following finds little nitrate in the soil. It starves when in competition for such with the microbial life in the soil.

Under such circumstances, plowing may be given the blame by those who have never understood the bacteria in the soil. But certainly it isn't the plow. It is the deficient supply of soil fertility that is too low to make weeds that can contain much in the way of nutrients from the soil and must, therefore, be made from air and water coming from above the soil. Nutrients from that source can serve to make only woodiness. The fertility is also too low to balance a woody or carbonaceous green manure as the main part of the microbial diet, and to leave anything in addition as nourishments for the wheat crop.

There are other scientific bases for plowing beside the aeration of the soil for the combustion or decomposition encouraged thereby as means of liberating plant nutrients within the soil. Many other phases of microbial life contribute to support the plow as an important agricultural implement. At various agricultural experiment stations, other scientists than microbiologists have given thought to the effects of incorporating organic matter into the

soil by the plow and other methods. Basic soil information in connection with the "debacle in which our American soils have drifted" has been established by other men of science who man our various stations. They include those concerned with soil fertility, plant nutrition, soil mineralogy, colloid chemistry, animal physiology, soil, and other aspects of science not even considered as closely connected with soils at so recent a date as 1910. All these can support the farmer in his art of plowing and can give a scientific answer, even if he can't, to the question "Why plow?"

(*to be continued in the next issue*)

# Controlling the English Sparrow

Condensed from The Extension Digest
Published quarterly by Extension Service, Univ. of Arkansas College of Agriculture

*W. J. Baerg*
Dept. of Entomology, University of Arkansas

THE English sparrow is, to most people, an unmitigated pest. At present, when the poultry industry is getting all possible emphasis throughout the country the pest places a considerable burden on poultrymen. It has been estimated that sparrows take from one-fifth to one-third of the feed put out for chickens.

Incidentally, the pest is not a sparrow, and neither is it English. Various names have been suggested, among them is European weaver finch. Presumably, the old name will stand, but it is regrettable, in that it tends to put in ill repute the dozen or more kinds of sparrows that are altogether beneficial.

Although these weaver finches were brought in from Europe with the expectation that they would aid in control of noxious insects, they limit their feeding very largely to grain. They thrive wherever there is an abundant food supply. When horses were largely replaced by cars and tractors, the sparrow population went down in a gratifying manner. However, at present, when the feeding of cattle and poultry furnishes an abundant and readily available food supply on every farm, as well as in many city lots, the sparrow population is rapidly increasing.

It is well known that the sparrows, by their persistence and

aggressive disposition, prevent such other more desirable birds as bluebirds, wrens, robins, and cardinals, from nesting about the house.

Various measures have been applied to reduce the sparrow population. A trap made of ¾ inch mesh poultry wire has been used with some success. Poisoning with strychnine is probably more effective. The formula recommended is as follows:

Pulverized
strychnine sulfate .....⅛ oz.
Hot water ..... 4 oz.
Starch or
wheat flour ....½ teaspoonful

The mixture is heated till the poison is dissolved and stirred till it thickens. It is then poured over a quart of wheat and stirred till all the wheat is well coated. The poisoned wheat may then be spread out to dry, after which it may be stored till needed.

A simpler method is to mix a suitable quantity of white arsenic with ordinary chicken feed.

Most important in the use of poison is to place it where poultry and other birds are not likely to get it. In some situations this may not be difficult. A poultry house with a flat or nearly flat roof might be used by first feeding the sparrows there for several days. By this method the poisoning would probably get the desired results in a few days, and the poisoned bait could then be removed.

Shooting the males when they noisily try to attract the female to some nesting site is fairly effective in reducing the nesting population.

For maximum results, all the various remedies require community effort. A town lot or farmyard, if freed from sparrows, will not remain so for more than a few days. Sparrows are constantly on the lookout for nesting space. However, community effort, if it can be obtained, can yield good results, inasmuch as the sparrows nest almost exclusively near dwellings. If the flocks about the barn and other buildings are eliminated, much feed for poultry and livestock can be saved.—W. J. Baerg, Department of Entomology

# How Long Will Seeds Live?

Condensed from New Jersey Agriculture

*Jessie G. Fiske*

N. J. Agricultural Experiment Station

THE most important structure of the seed is the embryo—a formed but unborn plant held for a time at rest. The vitality of the embryo is of the utmost importance, for this factor determines how long a seed will retain its power to germinate.

The physical factor involved in the resting life of seeds seems to be dryness. During the ripening of the seed on the plant, most of the water escapes without replacement, and this gradual withdrawal of moisture slows down all processes, without apparent injury, until there is almost no activity. At this point the respiratory action of the embryo is so slight that it can scarcely be measured even by the finest scientific mechanisms. Collective evidence indicates, however, that the processes are never completely stopped as long as the seed remains alive.

Many seeds retain their vitality best under relatively dry storage conditions, and under medium to low temperatures. Seeds that are dry may be subjected to extremely high or low temperatures without injury—a quality no other part of the plant enjoys. Well-dried seeds can be kept for some time above 100 degrees F. without damage, whereas active embryos will be killed quickly at 60 degrees F. It is partly for this reason that some seeds are capable of tiding the plant over unfavorable conditions when other vegetative parts are destroyed.

Not all seeds, however, react favorably to dry storage. Though crop plants maintain their germinating power best when stored at fairly low temperatures and at definitely low humidity, certain species of maples, poplars, and willows, for instance, will die if allowed to become too dry.

Although external factors are exceedingly important to the longevity of the seed, many inherent factors seem to play an important part. Thus, some seeds retain their germinating power only a short time regardless of the conditions under which they are kept. Seeds produced upon weak plants, for example, or seeds which are immature seem to have low vitality, and when

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planted give rise to weak plants—if they germinate at all.

All seeds will die eventually, but the cause of death in seeds kept under favorable conditions has not been adequately determined. In some cases it is thought to be due to the decomposition of proteins within the seed itself, or to changes in the composition of the embryo. The gradual but persistent utilization of reserved materials is probably an important factor in the eventual loss of vitality.

Certain legumes have been known to retain their germinating power fifty years. Some common weed plants produce seeds which will germinate after having been buried in the soil more than thirty years. Among these are common pigweed, chickweed, shepard's purse, and other species of mustards. This explains why old pastures and meadows, when plowed, sometimes blossom forth with an array of weeds not common to the farm. Some seeds that cannot stand dry storage, like the aforementioned willows and poplars, are formed in early spring and must find favorable germinating conditions immediately or they will perish.

Tests made from dated museum-seed specimens have shown some interesting facts concerning longevity. One test gave results in germination after 87 years, and one showed vitality after 120 years. In all of these trials it was the seeds with extra thick and hard coats that seemed to have retained their vitality.

From time to time there have been reports of the discovery of seeds in ancient tombs of the East, that have retained their germinative ability after hundreds or even thousands of years. Since none of these tests have been conducted by exact scientific methods there is an inclination to doubt the results. There is even evidence of the fraudulent introduction of fresh or relatively new seed in some of these tests. The longest authentic record of seed longevity belongs to the Indian lotus. Seeds of this plant taken from peat bogs buried, presumably 200 years, have been known to germinate successfully!

Seeds of nearly all plants undergo a resting or dormant period resulting in delayed germination. A similar rest period appears in the buds of trees and also in many bulbs or tubers, and is obviously a means of preventing premature opening in abnormally warm fall or winter seasons. It may therefore be presumed that the resting period of seeds has a like significance. Playing a part in this period of dormancy is a process of "after-ripening" during which period enzymes, acids, and other chemical substances essential to germination and growth form. This pause in the natural

development is not well understood by laymen and often causes impatience and even actual loss to the gardener.

Certain forest plants such as ash, hemlock, pines, dogwoods, and hawthorns must undergo after-ripening. Fruit seeds like apples, plums, pears, and cherries are also subject to this process with resulting delayed germination. Some garden plants, lily of the valley and iris for example, also pass through an after-ripening period.

Delayed germination may also be the result of a tough seed coat which resists the entrance of water and oxygen. By artificially breaking the coats of peach pits, canna, New Zealand spinach and some other seeds, germination can be hastened.

Though the majority of seeds of wild plants have a resting or dormant period, most of our cultivated plants seem to have lost this quality. This is probably due to the plants' complete disuse of the faculty, brought about by man's cultivation, selection, and care. Frequently the elimination of the dormant period results in loss to farmers for corn may germinate on the cob, peas in the pod, and wheat in the shock in warm and rainy weather.

It is always necessary to know whether a supply of seeds will grow, and frequently it is important to know whether seeds can be saved and utilized at a later date. Sometimes we buy too much seed for a given area; or bad weather or other obstacles may prevent timely sowing. We may have a rare variety, the seeds of which we would like to save; or a friend may give us some seeds from a plant which has especially pleased him. Can we save these, with any degree of success, for planting at our leisure?

We can, by using care, save seed for many kinds of domesticated plants. They must be dry, have a supply of oxygen, and be kept in a comparatively cool place. They must be kept in such a manner as to prevent an invasion of destructive insects and rodents. They should not be kept in airtight containers.

## AVERAGE DURATION OF GERMINATING POWER IN YEARS

*(Under favorable storage conditions)*

### Agricultural Crop Seeds

| | | | |
|---|---|---|---|
| Alfalfa | 6-8 | Fescue, Meadow | 2 |
| Bent Grasses | 5-4 | Fescue spp. | 1 |
| Bluegrass, Kentucky | 3-4 | Millets (misc.) | 4 |
| Bluegrass, Canada | 3-4 | Orchard Grass | 2-3 |
| Brome Grass | 5 | Rape | 6 |
| Cereals (mis.) | 4-5 | Redtop | 6 |
| Clover, Alsike | 2 | Ryegrass, Perennial | 2 |
| Clover, Red | 5-6 | Ryegrass, Domestic | 2 |
| Clover, White | 2 | Soybean | 2 |
| Clover, Crimson | 2 | Timothy | 5-6 |
| Clover, Sweet | 5 | Vetch | 3 |
| Cowpeas | 2 | | |

### Vegetable Seeds

| | | | |
|---|---|---|---|
| Artichoke | 3 | Kohlrabi | 3 |
| Asparagus | 3 | Leek | 2 |
| Beans (dwarf) | 3 | Lettuce | 6 |
| Beans (pole) | 3 | Muskmelon | 5 |
| Beans (lima) | 2 | Okra | 1 |
| Beet (garden) | 4 | Mustard | 3 |
| Beet (mangel) | 4 | Onion | 2 |
| Broccoli | 4 | Parsley | 1 |
| Brussels Sprouts | 4 | Parsnip | 1 |
| Cabbage | 4 | Peas (garden) | 3 |
| Carrot | 3 | Pepper | 2 |
| Cauliflower | 4 | Pumpkin | 4 |
| Celeriac | 2 | Radish | 4 |
| Celery | 3 | Rutabaga | 4 |
| Chard, Swiss | 3 | Salsify | 1 |
| Chicory | 3 | Spinach | 3 |
| Collards | 3 | Spinach, (N.Z.) | 1 |
| Corn, sweet | 3 | Squash (summer) | 4 |
| Cucumber | 5 | Squash (winter) | 4 |
| Dandelion | 2 | Tomato | 3 |
| Eggplant | 4 | Turnip | 4 |
| Endive | 5 | Watermelon | 5 |
| Kale | 4 | | |

# Ducks for Meat

**Condensed from Poultry Tribune**

*Stanley Weber*

DUCK raising is centered in certain localities throughout the United States where a select few have spent a lifetime in the business and there are also many small raisers scattered here and there throughout the 48 states.

The duck is only good for one purpose—a market bird at the age of nine to 10 weeks. In contrast, the poultryman may sell his birds as broilers, roasters, capons, pullets or fowl, besides producing eggs.

Duck raising has not been encouraged by any of the growers, poultry magazines or state colleges; yet, there are farms producing up to 250,000 ducks annually and hatcheries selling up to 700,000 annually. The large duck farms produce their own ducklings. Therefore, when a single hatchery sells up to 700,000 day-old ducklings annually, it shows there are a lot of small farmers learning how to raise ducks on a small scale.

It is the general belief that ducks are only marketable at the holiday seasons. This is a mistaken idea. Turkey growers once thought this, too. You will find an ever increasing demand for ducks the year round. Poultrymen in and around small cities and towns can always find a ready market for poultry of all kinds. They also can find a market for fresh young ducks with less competition and price cutting. The duck grower has his returns before the poultryman has a broiler, and without the expensive buildings, equipment and overhead. That should appeal to many in these times. There are duck raisers who are selling more dressed ducks than they actually paid for as day-olds—the mortality did not exceed the extras included in the shipment. Ducks do have diseases, but many farmers have raised them for years without experiencing any.

The biggest problem in raising ducks is the picking, but this can be overcome with a little practice.

Brooding ducks is similar to brooding chicks. Ducks do not require as high a hover temperature for as long a time as is usually recommended for chickens. Start your ducks as you would your chicks, allowing them three-fourths of a square foot per duckling for the first three weeks, and

Reprinted by permission from the Poultry Tribune, Mt. Morris, Illinois, April, 1943

about the same temperature under the hover.

After the ducklings are four days old, they should be allowed to go out of doors except in falling weather or zero weather. Shovel away the snow and see how they thrive and grow! Beware of allowing young ducks to get rain soaked. It is only after they have grown their feathers that they can withstand the rain. They should have some shelter for the first six weeks, and from then on some kind of shade to protect them from the sun and rain. Whether it be trees or sheds they will resort to it only when necessary.

From three weeks of age to six weeks of age they should be allowed one and a half to two square feet of house space per duck and very little heat, if any, except during cold weather.

From six to nine weeks of age they will require still more room and only enough heat in winter to keep the water from freezing. At least three square feet of shelter per duck is necessary and as much yard space as is handy and practical—say three times as much. Don't overcrowd your ducks, and you can use the same pens year in and year out. Take down the 18 inch wire used for fencing, and plow and harrow the yards once a year.

When the ducks are nine weeks old they are ready for market. They each will have consumed not more than 25 pounds of feed and will average five and one-half pounds. It is easy to figure your profit. It may not be much, but the old saying still holds—those who make a profit never lose money.

Ducks can be fed two ways—by wet mash feeding or pellet feeding. Both have their good and bad points, but space does not allow for any lengthy discussion, so I will dispense with the good old method of wet mash feeding under the present world conditions and say a word in favor of pellet feeding.

Pellet feeding of ducks is something new. Pellets are much easier to handle, involve less overhead, eliminate waste, save labor and really provide a balanced ration at all times, besides producing less fat per pound of duck meat and producing faster growth.

Pellets should be fed in self feeding hoppers—built to feed from both sides and holding only enough to last a week. A start-to-finish hopper can be built with a little thought. These hoppers can be used from the seventh day on. They need not be filled to capacity until necessary. They are cheap in construction and will hold up to one thousand pounds of pellets. One hopper will feed up to three hundred market ducks per week. For the first week it is a good plan to feed the ducklings

in some kind of a shallow container until they are able to use a feeder.

The feeding of pellets is very important. Everything must be arranged to suit the duck, because he must eat easily and comfortably, in order that he may consume his quota of feed in nine weeks.

Lights should be kept burning all night in the duck house or shelter as the duck is a very nervous bird. It puts on flesh fast, but it also loses flesh fast if it is frightened at all. Then, too, a duck is by nature an early morning feeder.

Drinking water is also important. Without it the duck will not consume the amount of feed necessary for rapid growth. The feeders and waterers should be arranged so they are handy for the ducks at all times. Give your ducks plenty of watering space. Ducklings do not need water to swim in, but they do require a trough large enough so they can wash their heads after each feeding.

Keep the ducks out of water for the first six weeks. Then, if possible, allow them to swim or wade in clean, cool water. It will keep them clean; they will grow better and will grow more feathers.

The dressing of ducks for market is usually done by scalding them in a tub of hot water at a temperature of about 190 degrees. This is easily done, and with a little practice anyone soon will learn how to rub off the feathers and pull out the remaining pins and down.

## Beef Production on Lespedeza Pasture

The animal husbandry and field crops departments of the Missouri College of Agriculture have just moved 80 steers off an 82-acre college farm, winding up another test period which proves that a lot of beef can be produced on small grain—lespedeza pasture on very ordinary land. This is a repetition of a pasture-feeding experiment that has been running on this farm for the last 4 or 5 years. It has been a farm-size investigation, which leaves no doubt as to results. The farm was in bad shape when taken over by the college. It was severely eroded. A tenant farmer had handled the place, planting mostly cane, following a rotation, someone humorously remarked, of cane, sassafras, and buck brush. The college put the land to small grains and lespedeza, the last 3 years keeping it continuously in wheat and lespedeza, with only a disking each year at wheat seeding time.

—*The Weekly Kansas City Star*

# They Make Pastures Pay!

**Condensed from The Farmer**

*William H. Kircher*

GET a cow with an 18-inch muzzle, a cruising speed of 30 miles an hour, and stamina to graze 10 hours a day at that speed (no time out for cud chewing and lolling around under trees) and you have a cow capable of producing 24 pounds of 4% milk a day even though all she has to eat is the grass from woods pasture that was overgrazed in May and early June.

The specifications for the super cow are based on these facts: To produce 24 pounds of 4% milk a day a cow must have the total digestible nutrients contained in 168 pounds of the kind of native grasses ordinarily found in Minnesota woods pasture. Careful square yard measurements were made of grass yields in such pastures and with a little figuring came the design for the dream cow.

The figures were given us by John Staley, soil conservationist of Winona, Minn. In that county, and in Wabasha, Fillmore, and some of the other hilly counties of southeastern Minnesota, farmers are getting away from the old short rations of grass by rejuvenating old pasture, seeding more land to pasture, and by pasture rotation.

One such farmer, L. L. Laughlin in Fillmore County, has contrived to provide his fine Brown Swiss herd with so much grass that even those cows in the herd producing more than 400 pounds of butterfat a year aren't eager for the little dabs of grain they are fed in the evening when on pasture. They mouth it around their mangers while they are being milked, then lie down to chew their cuds and forget about the grain the minute milking is finished.

The first two years after Mr. Laughlin bought his farm he depended on 30 acres of woods pasture and the cows didn't do well. Then he set aside three fields averaging about nine acres each for permanent pasture, seeding them to brome and alfalfa, and the crop land was laid out in four 12-acre fields on which a corn, grain and two years of hay rotation has been followed. Since organizing his farm that way Mr. Laughlin has grazed each of the three pastures only a week at a time so that each has a two weeks' rest to one week's graz-

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ing. Following this scheme the carrying capacity of the pasture is a little more than an animal unit an acre, and there is abundant feed for them.

What is good for dairy cows is just as good for beef cows. On the Paul Abrahamson farm near Lanesboro there has been set up a type of farming which uses labor efficiently and uses land profitably. Mr. Abrahamson has an excellent herd of registered Aberdeen-Angus. When he bought the 175-acre farm in 1937 he found gullies fingering up 30 rods into one of the best fields and some woods pasture not worth grazing. With the help of the Soil Conservation Service the farm was replanned, two patches of trees being fenced off to grow undisturbed, and grass seeded on eroding slopes. There was considerably more pasture and hayland after revamping the farm lay-out, but in spite of crop land reduction it soon became apparent that total feed production would be considerably higher than formerly.

The pasture mixture used is one common to the community—equal parts of timothy, alfalfa and red clover seeded about 12 pounds to the acre. Rotation is between two pastures, and pasturing is never begun until after it has had a good start.

Returns from Mr. Abrahamson's way of farming come with a minimum of labor. Cows are bred for April calving, and calves are sold in late fall at 425 to 450-pound weights.

No super cows with wide muzzles and 30-mile cruising speeds are needed on the John and Erwin Michael farm in Winona County. This 320-acre farm is located in what was formerly the Gilmore Creek soil conservation project, now a part of the Rolling Stone, Stockton, Gilmore Creek Soil Conservation district. In what was the Gilmore Creek project 58 of 59 farmers are using soil conservation practices, and that these practices are saving soil is evidenced not alone by healed gullies, and much higher production, but by Gilmore Creek itself. Ten years ago it was a rocky wash in drought periods and a raging, muddy little river after cloudbursts. Now it is crystal clear, and in shaded pools at creek bends you can fish for trout.

A few years ago the Michaels were grazing their cattle on woods pasture. The cattle got a lot of exercise, but little feed. Crop land was being gullied and wasn't producing profitable yields. Through rearrangement of fields and pastures the lay-out has been so changed that only the hills bear resemblance to their former selves, and even they have changed by elimination of gully scars on their steep slopes. Of the total land, 107 acres was wood-

land fenced off because its potential production was limited to timber and timber and cows are like water and oil. They don't mix.

There are 81 acres of good pasture, one part of it on a very steep slope, the soil tied there by a pasture grass mixture of red, alsike, and sweet clover, alfalfa, brome and timothy. Deep contour pasture furrows hold water where it falls. Whereas formerly there were poor pickings for a small herd, the Michaels now have a milking herd of 24 head of Brown Swiss, 16 head of young animals, and just as soon as a new and larger barn can be built there will be a 40-head herd to milk with a corresponding increase in young stock.

And though it may appear that the 107 acres they fenced off for timberland is waste, John Michaels and his son, Erwin, won't agree. While formerly young trees were nipped off the instant they poked their first green shoot above the surface of the soil, there are thousands of fine young oaks now, some of them six feet tall. The new barn is to be built of oak lumber from the woodlot. They have sawed and made ready for milling 135 of the older trees estimated to yield 27,000 feet of lumber at a sawing cost of $8 a 1,000 feet.

Summed up, the experience of these southeastern Minnesota farmers proves that a cow's time is too valuable to waste on hilly woods pasture. Better put her where she can get something to eat and let the woods produce timber. That way production is increased, labor is made more efficient, and soil is saved.

## Bee Food

Milk as a food for honey bees isn't at all out of place, say Minnesota Experiment Station apiculture specialists, who have tested and now recommend a mixture of four parts of soybean flour and one part of dried skim milk. This combination is made into a candy paste by adding sugar sirup or honey, stirring them together; is fed either in the cells or is made available in a dish. Sifted cottonseed meal can be used in place of soybean flour. The formula is suggested as a source of protein on which bees thrive and rear strong broods. It also has some vitamin value and is fed to bee colonies when they lack adequate stores of pollen, a situation such as may occur when protracted adverse weather has prevented their laying up the normal supply. It does not replace honey or sugar sirup as a source of carbohydrates in the bee's diet.—W. H., Minn.

—*Successful Farming*

# Benjamin Franklin and Agriculture

ONE of the earliest Americans to perceive that the agricultural resources of the country should not be wasted, Benjamin Franklin termed farming "the most honorable of all employments, the most useful in itself and rendering man the most independent." This remarkable inventor and scientist felt that farming must be something of a business and a science as well as a way of life.

Franklin's work in the field of writing had perhaps the most widespread influence in directing attention of the public at that time to the value of education in agricultural science. On May 14, 1743, he published his "Proposal for promoting useful knowledge among the British plantations in America." In it he suggested the collection and dissemination of information on a great variety of scientific and practical subjects, such as the virtues and uses of new-discovered plants, herbs, trees, roots; new discoveries in chemistry; introduction of new methods of improving the breed of useful animals; new improvements in planting, gardening and clearing land; and the nature of the soil and productions of different regions.

His interest in promoting knowledge of the importance of agriculture brought Franklin into contact with the Rev. Jared Eliot, of Connecticut, whose "Essays on Field Husbandry," and other agriculture subjects were widely read at that time. Frequent correspondence took place between the two friends, and such subjects as potash, the drainage of swamps, the cultivation of hemp, the planting of hedges and many other angles pertaining to farm practice were discussed. On numerous occasions the scientist employed his literary talents to familiarize the British with the opportunities which America offered to farmers. In 1760, at the close of the Seven Years War in America, the English ministry was undecided whether to take from France the sugar producing West Indian island of Guadeloupe or Canada. Franklin wrote by far the most profound article which appeared in the "pamphlet war" which was waged on the question and urged the government to keep Canada. The scientist realized the immense advantages which the American West offered for farming and the variety of products which could be raised there. His writings played

a great part in influencing British public opinion and the British ministry to keep Canada. An opponent of the English Corn Laws, Franklin presented a clever satire in 1766, entitled, "On the Price of Corn and the Management of the Poor."

Upon Franklin's second visit to England (1757-67), he had an opportunity to observe the wretched conditions of the English factory laborers and was convinced that the American farmers, who owned their own farms, were infinitely better off. He expressed his ideas in the following paragraph, which was written in 1760:

"Manufactures are founded in poverty. It is the multitude of the poor without land in a country, and who must work for others at low wages or starve, that enables undertakers to carry on a manufacture. But no man who can have a piece of land of his own, sufficient by his labour to subsist his family in plenty, is poor enough to be a manufacturer and work for a master. Hence while there is land enough in America for our people, there can never be manufacturers to any amount of value." Franklin believed that America's future greatness and economic prosperity depended on the production of agricultural products and on the promotion of foreign commerce in raw materials.

Outstanding among Franklin's services is his introduction of new varieties of useful plants and grains. From Europe he brought Scotch kale, the kohlrabi and Swiss barley. He promoted silk culture in Pennsylvania. He introduced the yellow willow for basket making and he taught the farmers of Pennsylvania to plaster their land. From Virginia he brought the broom corn, and from China, by way of England, he brought rhubarb used in medicine, unlike the already common garden type known as pie-plant in America. Abroad his agricultural activities profited France, which learned of the Newtown Pippin, while England became acquainted with fowl meadow grass. To France he also brought knowledge of various American trees, including nut-bearing trees and shrubs.

Franklin was the first person to experiment with gypsum as a fertilizer. He fertilized a large field with the chemical and traced the words, "This field has been plastered," in large letters along a roadside. Passers-by were able to distinguish the grass touched by gypsum because it was a brighter green than the rest of the field.

Although the projected establishment of a silk culture industry in the United States eventually failed, Franklin believed that the interior of America was suitable for the production and was active in the movement. As early as

1760 the scientist expressed his confidence in such an industry and in 1768 after Parliament had passed an act offering bounties for the production of silk in America, he made a recommendation that Pennsylvania seriously concern itself with the merits of cultivating silk.

On September 7, 1769, Franklin wrote to Cadwallader Evans that he had sent him a treatise on the management of silkworms. "There is no doubt," he wrote, "but that it might succeed in our country. It is the happiest of all inventions for clothing. Wool uses a good deal of land to produce it, which, if employed in raising corn, would afford much more subsistence for man than the mutton amounts to. Flax and hemp require good land, impoverish it, and at the same time permit it to produce no food at all. But mulberry trees may be planted in hedgerows on walks or avenues, or for shade near a house, where nothing else is wanted to grow. The food for the worms which produce the silk is in the air, and the ground under the trees may still produce grass or some other vegetable good for man or beast. Then the wear of silken garments continues so much longer, from the strength of the materials, as to give it greatly the preference. Hence it is that the most populous of countries, China, clothes its inhabitants with silk while it feeds them plentifully, and has besides a vast quantity both raw and manufactured to spare for exportation." (Carl Van Doren, pp. 428-29.)

Franklin was a member of several societies interested in the advancement of agricultural science. In 1756 he became a member of the Society for Encouragement of Arts at London, and in 1785 he became a member of the Philadelphia Society for Promoting Agriculture, one of the first agricultural societies in the United States. The inventor was also a member of the Societa Patriotica diretta all' Avanzamento dell Agricoltura, delle Arti Manifatture di Milano.

Thus it may be realized that the field of agriculture was neither neglected nor forgotten by the versatile man who bequeathed us a score of hints for better farming and thrifty cultivation of land.

# Lights "Pep" Tomatoes

**Condensed from Electricity on the Farm**

GROWERS in the vicinity of Indianapolis have been using lights for a number of years in the production of tomato plants. The practice has been a profitable one, and the facts which are presented below should be of interest to all plant growers.

All of the plants involved in this study were grown in greenhouses where other crops were being grown. The lights were first used on plants that were seeded in early November and later set out in greenhouses to produce winter tomatoes under glass. The same procedure is now being used to grow spring plants for outside setting.

In the results reported in the accompanying table it should be noted that a number of different comparisons have been made. Three different types of lamps were used, namely (1) ordinary Mazda lamps in R-40 reflector-flood bowls, (2) S-1 mercury arc lamps, and (3) fluorescent lamps. The Mazda lamps gave the better yields and at a much lower cost for equipment. The fluorescent lamps seemed to have possibilities. They are relatively high in first cost but low in operating cost.

The first co-operator placed his lamps closer to the flats and had 700 foot-candles of illumination on the plants during the seedling period, whereas the second co-operator had only 350 foot-candles of light. (A foot-candle is the measure of intensity of light.) The higher intensity gave somewhat better results.

Each of the four co-operators had some flats which were given no light, that is, the plants were grown in the usual way. Then each had certain flats which were lighted only during the seedling stage of growth, and other plants which were lighted both as seedlings and after transplanting. In every case the plants which were lighted for the longest periods set tomatoes on the highest percentage of first blooms. They were early yielders. These longer lighted plants were also the ones that produced the greatest number of pounds of tomatoes per plant.

It was found that the reflector type flood lamps should be suspended 2 feet above the seedlings and be raised as the plants grew.

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The lamps should not be closer than 2 feet above the plants to prevent damage by the heat.

The lamps were usually burned from 5 to 8 hours per day: 2 to 3 hours before sunrise and 3 to 5 hours after sunset, except on cloudy days, when they were used more hours.

In using these high wattage lamps it is best to use porcelain sockets, as they stand the heat better. One should also be careful not to splash water on the hot lamps as that will break the glass.

During the past spring growers used the lamps on the flats immediately after planting the seed. With the lamps about 18 inches above the soil, the seeds germinated in three days. The lamps were then raised to 2 feet. The plants were ready to transplant in three weeks instead of the usual 6 to 10 weeks without lighting.

In the tests there was no way to tell what part of the stimulating effect of the lamps was due to heat and what to light. Since there is practically no heat involved in fluorescent lamps, but there was a decided increase in growth and yield, it seems quite certain that the light was a big factor in all of the results attained in the experiments. Lights are now being used by a number of growers.

**RESULTS OF TOMATO PLANT LIGHTING**

| Cooperator | Period of Lighting | Lamps Used No. | Lamps Used Type | Days Light Used | Hours per Day | Number Plants Checked | % 1st Blooms Set | Lbs. Picked per Plant | Lbs. Gain per Plant | Ltg. Cost @ 3c KWH | Ltg. Equip. Cost | Lighting Cost per Plant | Light Intensity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. 1 | Seedlings | 1 | 300 W. Ref. Fl. | 14 | 4 | 720 | 82% | 6.69 | 2.81 | $0.99 | $1.75 | 1/5 of 1c | 700 ft. cdls. |
| | Transplants | 2 | 300 W. Ref. Fl. | 36 | 4 | 720 | 84 | 6.86 | 2.98 | 3.51 | 3.50 | 1/3 of 1c | |
| | None | None | | None | .. | 500 | 63 | 3.88 | None | None | None | None | |
| No. 2 | Seedlings | 1 | 300 W. Ref. Fl. | 15 | 3 | 460 | 78% | 5.76 | 0.87 | $0.41 | $1.75 | 1/6 of 1c | 350 ft. cdls. |
| | Transplants | 3 | 300 W. Ref. Fl. | 40 | 3 | 460 | 81 | 6.04 | 1.15 | 4.32 | 5.25 | 4/5 of 1c | |
| | None | None | | None | .. | 460 | 61 | 4.89 | None | None | None | None | |
| No. 3 | Seedlings | 1 | 450 W. S-1 | 30 | 4 | 455 | 84% | 4.17 | 0.59 | $1.62 | $45.00 | | |
| | Transplants | 1 | 450 W. S-1 | 29 | 4 | 455 | 87 | 4.83 | 1.25 | 3.18 | 45.00 | | |
| | None | None | | None | .. | 455 | 56 | 3.58 | None | None | None | | |
| No. 4 | Seedlings | 3 | Units, Fluorescent | 18 | 4 | 60 | 77% | 4.66 | 1.00 | $0.27 | $25.00 | | |
| | Transplants | 3 | Units, Fluorescent | 28 | 4 | 60 | 83 | 6.00 | 2.34 | 0.66 | 25.00 | | |
| | None | None | | None | .. | 60 | 57 | 3.66 | None | None | None | | |

# How Can We Get Highest Yields?

**Condensed from Missouri Ruralist**

WHAT combinations of crops produce the most pasture, the most roughage, the most grain? How can soil be handled to get highest yield? These are important questions at any time, but are even more vital now that our nation needs maximum food production.

To help in finding answers to these questions the Missouri College of Agriculture maintains a system of outlying farm experimental fields, located in the various sections of the state. Practical, fact-finding tests are run to seek out practices especially adapted to the section in which the fields are located. For Missouri, extending into the Western Plains, the rich Central States Corn Belt, the Ozark mountains and down into the Southern Delta lands, naturally has a great variety of soils and climate. No one experimental field could possibly be typical of all of these varying conditions.

A series of meetings has been held at each of these outlying fields this summer, conducted by extension specialists of crops and soils.

Despite what we have just written about the great variety of Missouri soils and climate, one crop stood out for its performance. From the cotton patches of Southeast Missouri lowlands to the bluegrass pastures of North Missouri this stellar performer was sweet clover.

Sweet clover used as a green manure puts the "oomph" in soils so needful of organic matter. And sweet clover put into a permanent pasture adds extra days of grazing—on both ends of the grazing season.

We have become accustomed to the amazing versatility of lespedeza, the way it fits into so many combinations with other crops. But now it seems that sweet clover will find even more niches on our farms.

At Sikeston, on the farm operated by Carl Luper, it was in use as a winter legume in a rotation with corn, cotton and oats. There was such a contrast in a check strip in corn following sweet clover that Mr. Luper was closely questioned as to how he planted and cultivated the 2 areas. The corn grown on land that had been limed so that it would grow sweet clover promised a good yield, perhaps better than 50 bushels to the acre. Corn on land that had been unlimed and therefore had no sweet clover stand to turn under ahead of the corn was mak-

**Reprinted by permission from the Missouri Ruralist, Sept. 25, 1943**

ing only nubbins. Sweet clover in a rotation with wheat also gave high yields.

In all the fields it was demonstrated once again that stands of sweet clover without liming are the exception rather than the rule in Missouri. And so it develops that the wise use of sweet clover, with all its potential power to boost yields, lies in a real, honest-to-goodness soil-improvement program with liming just as important as the actual planting of sweet clover.

At Sikeston it has been shown that nitrogen is the first need of the soil. This is best supplied by a legume, with sweet clover at the top of the list. Next the soil needs phosphorus the most, which can be supplied by applying phosphate. Potash usually pays the least dividends of the 3 fertilizer elements, but may be a limiting factor to keep yields down, altho nitrogen and phosphorus are plentiful in the soil.

It now appears that decaying organic matter is even more important than the minerals needed to make plants grow. This organic matter rotting in the soil supplies something you just can't buy in a sack. Of course, the minerals that you can buy are necessary. But it is said that 90 per cent of the food a plant gets from the soil comes from decaying organic matter.

This is where sweet clover fits into the picture. Plowing under second-year sweet clover fits into the common rotations with row crops so well.

Use of sweet clover as a green manure crop, tho, has been a long-established practice on some of our best Missouri farms. It is as a pasture crop that sweet clover is finding itself in a new setting.

Up at the Louis Van Buren farm at Lathrop, sweet clover in a permanent pasture gave the most days of grazing of any crop added to bluegrass. Bluegrass alone supplied 58 days of grazing—that is each acre supported one animal for that many days. Gain of beef, to the acre, on this plot was 101 pounds.

Bluegrass and lespedeza, unlimed, resulted in 155 pounds of beef to the acre and 89 days of grazing. Bluegrass and lespedeza, limed, produced 195 pounds of gain and 108 days of pasture. Bluegrass and sweet clover gave a very superior performance of 230 pounds of gain and 120 days of pasture.

Thus we can see that one of the easiest ways of getting more out of our permanent bluegrass pastures of North Missouri is to lime them and add sweet clover. It is surprising how much sweet clover can grow in a good stand of grass. No matter how thick the grass, there is room for both first- and second-year clover. Sometimes a balance is struck between

the grass and the clover and they grow in harmony for many years.

Sweet clover in a rotation with small grain offers good pasture possibilities, too. On the Niles farm, Henry Elliot, manager of the farm, reports that this year second-year sweet clover made 54 days of pasture this spring, and that 19 bushels of wheat were harvested from the field with first-year sweet clover, which has yet to supply fall grazing.

The method used in following this system on the Niles farm probably is the best in such rotations. Two fields are used, with first-year sweet clover being grazed after wheat is taken off, then second-year sweet clover being grazed heavily the next spring and summer with wheat again in the fall.

There are a couple of rules to follow to get maximum grazing from sweet clover handled in this fashion. The first-year clover should not be grazed too soon in the summer. Save it until fall, that's when you'll probably need it most anyway—after lespedeza is drying up and going to seed. It might be said here that first-year sweet clover is best not cut for hay—you are too likely to kill your stand. It's a mighty strong temptation, however.

The other rule of grazing sweet clover is to keep it down the next spring, don't let it get above knee-high. You may have to borrow some of the neighbor's cows to get this done, however.

So much for sweet clover, its use as a soil builder and a pasture crop will grow as Missouri farmers appreciate the possibilities the crop offers.

With so many million acres of lespedeza over the state many folks are wondering just which small grain fits in best with lespedeza to give the most grain and grazing. It is generally recognized now, we believe, that growing a small grain with lespedeza is much better than growing lespedeza by itself.

Like so many cropping problems, there is no answer that fits every farm. Generally speaking, wheat is the best crop on better land; rye probably gives the most on less fertile land.

On the Niles farm in Texas county, a farm that is typical of much of South Missouri, rye and lespedeza gave 121 days of grazing this year, 128 days last year. Wheat and lespedeza gave 79 days this year, 112 last year. Both fields were treated with 200 pounds of phosphate. Barley and lespedeza gave 76 days of pasture up to September 7, with 33.4 bushels of grain.

Oats and lespedeza gave 35 days of grazing and 1,976 pounds of hay.

Soil treatments have much to do with the productiveness of small grain and lespedeza rota-

tions. In a soils test at the Grisham farm this year barley made only 1.9 bushels to the acre when no treatment was given the soil, and lespedeza cut for hay on the same plot made 920 pounds to the acre. When phosphate was applied to the barley, the barley made 11.5 bushels, and 2,380 pounds of lespedeza were harvested. When lime and 10-20-20 fertilizer were applied the barley yields were 9.7 bushels, the hay yield 2,900 pounds.

A number of plots at the Grisham farm indicated that fertilizer makes the difference in crop failure or crop success in a bad year, with both wet weather and dry weather to contend with.

One interesting experiment was run at the Bolivar field, which is being discontinued after this season. The soil experts were wondering what effect combining wheat and putting the straw on the land would have compared with removing the straw entirely. When the straw was removed yields ran about 16 bushels to the acre; when put back with a combine they ran 21 bushels. Therefore, we can assume that combining and getting the straw back into the soil boosts yields 4 or 5 bushels to the acre.

Perhaps you are one of those farmers who still would rather have a good stand of red clover than anything else you can think of. Tests at the Lathrop field offer you hope. In a rotation of corn, oats, wheat and red clover and timothy good stands are growing on plots receiving lime and phosphate and manure. One of the ways of getting a stand was putting 500 pounds of fine lime in with the wheat with phosphate. If you can't get several tons of lime spread on your fields as you would like due to wartime conditions, you might be able to get this job done. Stands were mighty poor where no treatments were applied.

How do sweet clover and lespedeza compare as green manure crops? Folks who claim everything for lespedeza are due for disappointment here. At the Van Buren farm in Clinton county, corn after lespedeza made 69 bushels to the acre; sweet clover land made 82 bushels.

In a series of tests with fertilizer on corn, little difference could be seen before the corn was shucked. It was noted that phosphate advanced the maturity of the corn.

For growing alfalfa you can't beat the lime and phosphate combination, as shown at Lathrop. With these soil-building "twins" the yield of alfalfa was 4,440 pounds for second-year alfalfa. With lime alone the yield was 3,727 pounds. With phosphate alone the yield was 3,060 pounds, but was mostly grass. No stand was had without treatment.

Lespedeza can be used to good advantage in permanent pasture in some instances. At the Guy McDaniel farm at Bolivar, this combination looked about as good as any on the field. To get such a good stand, however, 150 pounds of 0-20-10 were applied in alternate years.

Orchard grass was another pasture crop that looked good at several of the fields. Grown in permanent pasture it made lots of good grazing.

# $825 from One Turkey Hen

**Condensed from Pennsylvania Farmer**

THE gross return from a pair of White Holland turkeys in one year was $825. This hen and gobbler are members of a flock at the Penna. State College, which under the direction of P. H. Margolf and H. C. Knandel has been undergoing a breed and management improvement program.

The hen laid 115 eggs last year, 15 more than the average Penn State White Holland hen and twice the number laid by the average turkey hen in Pennsylvania.

Of the 115 eggs 87 hatched. The state average is around 50 to 60 eggs, of which about half hatched, while the college flock average this past year was 100 eggs of which sixty-eight percent hatched.

Eighty-two of the 87 poults survived and grew to table size. When ready for market they weighed 16 to 17 pounds apiece, fully dressed, and were plumped to perfection.

Eighty-two 16-pound dressed turkeys total 1,312 pounds of meat, which at the turkey ceiling price of 63c a pound was worth $825, a tidy sum for the offspring of one turkey hen and a gobbler.

The improvement program under which these turkeys were produced included: (1) artificial lighting to bring hens into production; (2) riboflavin added to the feed to promote good hatches; (3) supervision of mating, the flock being handled in small groups; (4) trapnesting and the retention of best individuals for breeding purposes.

Reprinted by permission from Pennsylvania Farmer, Pittsburgh, Penna., Dec. 11, 1943

# The Trash Mulch Method of Reclaiming Broomsedge and Poverty Grass Lands with Alfalfa

Condensed from Bi-Monthly Bulletin, Ohio Agricultural Experiment Sta.

*H. L. Borst and R. E. Yoder*

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TO the many Ohio farmers who are convinced that alfalfa will not grow on their unproductive, eroded hilly fields, the Soil Conservation Experiment Station and the Ohio Agricultural Experiment Station accomplishment of raising good alfalfa crops on such land is more than eye-opening news. For many a discouraged owner of hilly farm land it is the first step on the way to profitable farming, especially at a time when alfalfa and the livestock it will feed are in such demand.

It is common belief that alfalfa will succeed only on soils at fairly high levels of fertility. Prospective growers have been advised to build up their soils for a rotation or so before attempting alfalfa. They have been advised to put a little alfalfa seed in their meadow mixtures to "prepare" their soil for alfalfa. Consequently, using alfalfa seeded directly as one step in reclaiming impoverished soils may seem revolutionary to many; in a way it is, but constructively so.

Basic requirements for alfalfa are: favorable climate, well-drained soil, nearly neutral soil reaction, an ample supply of mineral elements. Experiments show that alfalfa will grow where these conditions are met. Climate is generally favorable for alfalfa anywhere in Ohio. Muskingum and related hill soils are well drained, usually overdrained rather than underdrained. Consequently, when lime and the mineral fertilizers are added in sufficient quantities, these soils make a favorable location for alfalfa.

Another important key to success with alfalfa under these conditions is to protect the land from the destructive forces of rainfall and erosion by leaving the soil covered with a blanket of organic material. Existing vegetation, which usually consists of broom-

A joint contribution of the Research Division of the Soil Conservation Service and the Ohio Agricultural Experiment Station

sedge, poverty grass, and weeds, is converted into a surface trash mulch which promotes infiltration, decreases and controls runoff, eliminates erosion, and conserves moisture by decreasing surface evaporation. This protection cannot be provided by plowing, but it can easily be by disking the soil in the proper way while preparing the seedbed for the new seeding. Seeding the meadow directly, without the conventional small grain, eliminates competition by the so-called nurse crop.

Effectiveness of the "trash mulch" method of direct seeding of meadows in controlling soil and water losses resulting from erosion is shown in table 1.

For six years, alfalfa-grass meadows have been established successfully without plowing on eroded, unproductive broomsedge (*Andropogon virginicus* L.) and poverty grass (*Danthonia spicata* L. Beauv.) hills at the Soil Conservation Experiment Station, Zanesville, Ohio. Meadows thus established have produced an average of 2.5 tons of alfalfa-grass hay per acre the year after seeding. The yields obtained are almost 1 ton greater than those from the average hay field in Ohio.

Experiments aimed at establishing desirable vegetation on eroded run-down land have been carried on at the Soil Conservation Experiment Station since its

**TABLE 1—Erosional losses for two watersheds seeded by two different methods***

| Seeding method | Size of watershed in acres | Slope of watershed in per cent | Soil and water losses† Runoff in inches | Soil losses in tons per acre |
|---|---|---|---|---|
| Conventional—in wheat ..... | 1.69 | 12.7 | 12.18 | 21.3 |
| Direct seeding—trash mulch .. | 1.63 | 21.7 | 2.64 | .1 |

*Results from North Appalachian Experimental Watersheds, Coshocton, Ohio. Courtesy of Soil Conservation Service.

†Annual soil and water losses for 1943, the year in which the seedlings were made.

**TABLE 2—Hay yields obtained from alfalfa-grass meadows seeded directly on eroded land without plowing**

| Meadow mixture seeded | Year sown | Hay yields in tons per acre 1939 | 1940 | 1941* | 1942 |
|---|---|---|---|---|---|
| Alfalfa, timothy, and orchard grass ..... | 1937 | 2.60 | 2.77 | 1.75 | 2.68 |
| Alfalfa and timothy ..... | 1938 | 3.00 | 3.25 | 2.25 | 3.90 |
| Alfalfa and bromegrass ..... | 1940 | .... | .... | 1.90 | 3.35 |
| Alfalfa and orchard grass ..... | 1940 | .... | .... | 1.75 | 3.00 |
| Alfalfa and orchard grass ..... | 1941 | .... | .... | .... | 1.60† |

*Yields low because of low rainfall.

†One cutting only.

establishment. Early studies supported the common belief that establishing a cover on eroded or run-down land in an effort to return it to a productive state is a slow process.

A trial seeding of alfalfa was made on a badly eroded field in the spring of 1936. About one-half the area used was bare; the rest was covered by a sparse growth of poverty grass and some briars. The area, an eroded Muskingum silt loam, had lost most of its topsoil. The soil reaction was very acid, approximately pH 5.4.

To this field, coarsely ground limestone (20 per cent through 100-mesh) was applied at a rate of 4 tons per acre. The land was disked. Twenty per cent superphosphate was put on at 400 pounds per acre. Inoculated, hardy alfalfa was sown at about 15 pounds per acre. When this was done, strips of timothy, smooth brome grass, and orchard grass were sown across the area, which was then cultipacked on the contour.

The resulting seedings were so promising that similar plantings have been made each subsequent year except 1939.

The area used in 1937 was similar to that treated in 1936. There were some bare spots, but most of the field had a fair growth of poverty grass. The land had previously received some lime, and a small portion of it had been seeded to orchard grass in 1933. Most of the area had been in pasture for more than 20 years. The 1938 area had been cropped last in 1931 and had received some lime previous to that date; at the time of the test it was covered with weeds, except for an occasional patch of thin bluegrass. The five areas used in 1940, 1941, and 1942 had been abandoned for more than 10 years, and none of them had ever been limed; their vegetation was similar to that of the other areas except that more broomsedge was present. Wherever made with proper care, such direct seedings have been successful.

Three cuttings of hay have been made on all areas each year following the year of establishment. First cuttings each year have been mixed hay; second and third cuttings have been nearly straight alfalfa. The hay yields have equaled or exceeded those of the rotation meadows on the Soil Conservation Experiment Station except in 1941, when they were low because of scarce and poorly distributed rainfall.

### *How to Do It*

As a result of the experiments described, the following procedure is recommended for the direct establishment of alfalfa meadows on eroded hill lands:

*Apply lime,* always enough to neutralize the acidity of the soil or

very nearly so, anytime before sowing the alfalfa; the earlier the better. Have the soil tested and take no chances. Be sure to use enough lime.

*Disk* in late March or early April as soon as the soil can be worked. The soil should be moist, not dry, when disked. It is better to disk the soil a little on the wet side rather than wait too long. The field should be well disked but not worked up into a fine or dusty condition. The old vegetation, which forms the important protection against the forces of erosion, should be left on or near the surface. It is usually necessary to put considerable weight (200 to 400 pounds) on the disk, particularly if the old vegetation is heavy. If the old vegetation is an extremely heavy growth of broomsedge, it may be desirable to remove enough of it so that the disk can cut through. A tractor disk does a better job than a horse-drawn implement. In fact, heavy sods cannot be cut up without tractor power. Where the old vegetation is thin, double disking (lapped one-half) twice will be sufficient. Do not try to prepare a deep seedbed. In fact, avoid doing so. Areas with a dense growth may require three and even more double diskings. As a somewhat cloddy seedbed is desired, it is not necessary to harrow except possibly with a springtooth, which keeps the trash mulch and clods on top of the seedbed. Obviously, tillage operations, particularly the final operation, should be done on the contour.

*Fertilize* with 0-14-7 or 0-12-12 at a rate of 350 to 400 pounds per acre. Alfalfa requires an abundance of phosphate and potash, as well as lime. Neglecting to supply fertilizer may result in seeding failures.

The fertilizer used in most of the early trials was 4-10-6. Since the opinion was current that alfalfa will thrive only on soils of good fertility, a complete fertilizer with a fair nitrogen content was applied. However, seedings made with phosphate-potash fertilizers in 1941 and 1942 appear as thrifty as those made with fertilizer containing nitrogen; so the use of a nitrogen-carrying fertilizer is not recommended. The fertilizer should be drilled into the soil with a grain drill either before, or at the time, the seed is sown.

*Seed* with a mixture of alfalfa and grass. The following seeding mixtures (pounds per acre) are suggested:

Mixture No. 1—Alfalfa 10; timothy 6

Mixture No. 2—Alfalfa 10; orchard grass 5

Mixture No. 3—Alfalfa 10; alsike 2; timothy 6

Mixture No. 4—Alfalfa 10; ladino clover 1; timothy 6

Timothy, orchard grass, and smooth brome grass have been used along with alfalfa in these trials. Including a grass in such seedings results in better erosion control, reduces weed growth, increases the yield, helps prevent heaving, and provides a cleaner crop by supporting it above the soil. Orchard grass has proved the most easily established in these trials. Although a good grass for poor soils, orchard grass is not the ideal one to sow with alfalfa for hay, as it matures too early. Only mediocre stands of timothy have been obtained. Tests at Columbus show that additional timothy can be drilled into alfalfa seedings in September with considerable success. Since timothy is somewhat late maturing, it is apt to delay the first cutting of hay, although a new early maturing timothy, Marietta, promises to be more satisfactory. Experience at other experiment stations indicates that smooth brome grass is probably the best grass to mix with alfalfa if the meadow is to be held for more than 2 years and used for grazing purposes. Since satisfactory stands of brome grass have not as yet been obtained in these trials, it is not included in the recommended mixtures. In one seeding, alsike was included with the alfalfa, and it appears that this is a good combination, especially where "seep spots" occur.

*Inoculate* the legume seed thoroughly. Sow the seed broadcast with any hand seeder or grain drill with a grass seed attachment. Seed and fertilizer can be applied at the same time if the seed tubes are arranged so that the seed falls back of the fertilizer tubes.

*Cultipack* the seedbed as the last operation before seeding. In the trials described, the areas were cultipacked after seeding, only. Since a compact seedbed is desired, cultipacking before seeding, as well as after, is recommended if time permits. Cultipacking should be done on the contour.

*Clip* the new meadow seeding to control weed growth. The field may look weedy and unpromising the first season. Clip off the weeds once or twice during the first summer whenever they reach a height of 8 to 10 inches; otherwise growth may become so rank that the alfalfa is choked out. This clipping should be done before mid-September if good fall growth for winter protection is desired.

In a very favorable season, considerable forage growth may be made the first season. It is better to leave this on the field. However, if any hay is made, it should be cut before September 15.

From these trials, it seems that alfalfa holds promise as a crop to

utilize profitably, and at the same time rejuvenate, eroded soils. Alfalfa has several characteristics which make it an exceptionally valuable soil-reclaiming crop for eroded hillsides if generous amounts of lime and fertilizer are used. Its root system goes deep for nutrients and moisture and adds many pounds of highly nitrogenous organic matter. The water-absorbing capacity of the soil is improved by this organic matter and by the openings left by decaying roots. Once established, alfalfa, unlike red clover, lives for several years, thus eliminating the necessity for frequent tillage of the soil.

Although starting alfalfa sounds expensive, it really is not. Lime is a necessity in most of eastern Ohio whether alfalfa is grown or not. The cost of the failure to use enough lime in eastern Ohio greatly exceeds the cost of the lime required to correct the situation. The fertilizer required is only a little more than should be used for wheat, a crop which returns very poor yields on such soils. The seed expense is not out of line when the long life of an alfalfa-grass meadow is considered. In favorable seasons, some hay or pasture can be had the year the seeding is made. Forage returns the year following sowing should more than cover the cost of establishing the crop. It is well to remember that a ton of good early cut alfalfa hay contains as much protein as a ton of bran. Areas sown in the manner described can be harvested for hay or grazed off. They should fill a real need for high-quality forage during midsummer, when permanent bluegrass pastures are apt to be short.

The "trash mulch" method of direct establishment of alfalfa-grass meadows on the "worn-out," badly eroded hill lands of eastern and southeastern Ohio possesses much promise as a means of restoring the productiveness of such lands. Farmers are urged to try the method, in a small way at first, to see how it works under their particular conditions. If there is sufficient vegetation on the ground to be converted into an effective "trash mulch," hillsides too steep for row crop cultivation can be converted immediately into high-quality forage-producing areas without creating an erosion problem.

# Breeding for Egg Production

**Condensed from Everybodys Poultry Magazine**

*G. T. Klein*

WITH the shortage of feed making necessary a reduction in the number of chickens raised in 1944, breeding assumes greater importance in meeting future needs. Through breeding and through the purchase of production bred chicks can come less broodiness, and greater laying ability.

A better knowledge of genetic principles has entirely changed our breeding methods. No longer is the emphasis in the selection of breeding stock placed upon the appearance of the bird. No longer is breeding stock selected largely on the basis of body shape which was at one time held to be very closely associated with production.

Poultry breeders have learned that even the number of eggs produced by a bird in a year is by no means a criterion of her ability to transmit to her daughters the inheritance to lay an equal number of eggs. Poultrymen by the hundreds have failed to make a success of breeding poultry because they depended alone upon the trapnest records of hens.

Some new method of evaluating a breeding bird had to be devised. It was soon to be demonstrated that this test is the kind of progeny or offspring that are produced. Whether it be male or female and whether it be egg color inherited in a very simple way or the complex inheritance of egg production, the same rules hold true.

Many have been the carefully selected matings of birds possessing what seemed to be desirable body type, shape and comb and with desirable egg production and color on both the dam and sire side only to find that the daughters gave egg production and egg color inferior to either of the parents. If the comparatively simple method of selecting stock on the basis of the parents' performance alone would work, we would have long ago had nothing but 300-egg strains in the poultry world.

The true test of a value of a bird as a breeder is the kind of progeny it produces. It is not the egg record of a dam that counts but the record of her daughters. In the early work on breeding for egg production at the University of Maine, breeders selected on trapnest records alone failed to give improved egg production. It

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was soon learned, however, that there were certain families that gave daughters with a high average egg production. When these selected families were used, egg production immediately improved and the progress that was expected was attained. The progeny test has stood the test of time, and poultrymen who have succeeded in breeding poultry for egg production, special meat qualities or other characters not based on appearance alone, have resorted to the progeny test.

*A 10-Point Program*

For nearly a quarter of a century poultry has been bred scientifically for egg production at Massachusetts State College. In addition to the rigid requirement that the stock be free of pullorum disease, a ten-point program has been developed which is being widely followed by poultrymen. This program embodies the following:

1. *Early Sexual Maturity.* The age at which first egg is laid is recorded. Hens and families requiring longer than 215 days for Rhode Island Reds are not used in the breeding pens.

2. *High Intensity.* Birds with an average minimum clutch size of not less than three eggs are selected for breeders. Breeders capable of laying a large number of eggs per month are very essential in the breeding pen.

3. *Non-broodiness.* Each broody period means a loss of about 15 days from egg production. It is difficult to eliminate entirely from a flock because much broodiness is deferred and does not show up until the second or third year. It is also inherited in such a way that it is difficult to get rid of. The geneticist calls it two dominant complementary genes A and C. That it can be greatly reduced is attested by the figures from the Massachusetts State College experimental flock. In a flock which exhibited 86.31 per cent broodiness in 1916 there has been a reduction to 2.16 per cent in 1937.

4. *High Persistency.* The ability to lay for a full 365 days after coming into production is a very desirable character. It influences annual egg production tremendously. It is recommended that no females be used for breeders that have not laid for at least 300 days and that male breeders should carry an equally good or superior inheritance for persistency.

5. *Winter Pause.* This is interpreted to mean a pause in egg production of eight days or more during the period November 1 to March 1. It is tremendously influenced by environment, and it is difficult to identify a true pause in a bird. Selection of breeders against pause has greatly increased annual egg production.

6. *High Hatchability.* Only females qualify for breeding, of

whose fertile eggs 85 per cent are hatchable.

7. *Egg Size.* Pullet breeders are selected for an egg size of 24 to 27 ounces to the dozen and hen egg size of 25 to 28 ounces. Males must be equal in inheritance.

8. *Mortality.* The laying house mortality standard is 15 per cent or less without culling. Breeders and families with records greater than this should not be used. Such a program will reduce particularly paralysis and allied diseases, reproductive troubles, tumors, and certain liver infections.

9. *Minimum Size of Family.* A family should not be included in the breeding pen unless there are at least seven daughters.

**Relationship of Number of Desirable Characters to Annual Production**

| Number of Characters | No. of Birds | % of Birds | Average Annual Egg Production |
|---|---|---|---|
| 0 | 31 | 1.35 | 149.03 |
| 1 | 158 | 6.87 | 156.73 |
| 2 | 375 | 16.30 | 173.78 |
| 3 | 717 | 31.17 | 200.83 |
| 4 | 648 | 28.17 | 227.32 |
| 5 | 371 | 16.13 | 252.15 |

10. *Body Weight at First Egg.* A minimum weight of 5.5 pounds for Rhode Island Reds is required at Massachusetts State College. There is a favorable relationship between body weight and mortality during the pullet year.

*Early Feathering Desirable*

In addition to this ten-point program of breeding for high egg production, selection of individuals that feather early is a part of the Massachusetts program. This selection can be made only of cockerels that feather well on the back and is made at eight weeks of age. Pullets themselves cannot be accurately selected, but are assumed to carry the early feathering character if their brothers exhibit it.

Selection of hens that lay eggs of good shell texture and have desirable egg quality is also a part of the program.

Our experiences in breeding poultry in Massachusetts is certainly most favorable to the use of the progeny test or family records. We feel that trapnesting without a careful analysis of family records is useless and we also feel that a satisfactory breeding program cannot be carried on in a small flock because of the dangers from inbreeding. Perhaps a flock of 600 or 700 is the minimum. Pedigreed birds should certainly be purchased on the basis of family records rather than individual dam records.

The characters that most affect egg production—early sexual maturity, high intensity, no winter pause, non-broodiness and high intensity—have been carefully analyzed in the Massachusetts State College flock. All birds were housed by families and no culling was done. The table shows their importance in relation to egg production.

# Small But Fruitful

Condensed from Successful Farming

*H. B. Tukey*

New York State Fruit Breeding Station

FEW developments in fruit growing have aroused more popular interest than the announcement, a few years ago, of a new line of rapid-maturing, dwarf apple trees. Now, after more than a decade of experiment, the virtues and limitations of these trees have been fairly well explored, and numerous trial plantings have permitted the listing of wide areas where they can be set out with reasonable expectations of success.

Contrary to popular belief, these so-called dwarfs are not limited to a particular apple variety or to a certain type or size of tree. Rather, they are produced by grafting the desired variety onto one of the various dwarfing types of rootstocks which control the ultimate growth of the tree.

If the Baldwin apple, for example, is grown from the extreme dwarf rootstock, which now bears the standard designation, "Malling IX," the tree will be sturdy, low branched, and spreading. The Northern Spy on this same rootstock will grow taller and more shapely and erect. In other words, the trees will be true miniatures of the varieties they represent. Grown from semi-dwarf rootstocks, such as Malling I or Malling XVI, the trees will grow much larger, but their varietal characteristics will be no less apparent. Regardless of the degree of dwarfing, the fruit will be of a size and quality typical of its variety.

These rootstocks are not really "new." Some of them have been known in Europe for nearly a century. But during that period the types became badly mixed and often mis-labeled. They are new, however, in the sense that they were more recently separated into pure lines and standardized at England's East Malling Research Station. This accounts for the name "Malling," with the Roman numerals added to identify the sixteen different rootstock types that were originally chosen for experiment.

Still more recently, the rootstocks were brought to this country and subjected to extensive tests by the New York State Experiment Station. The more promising types were tested for

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soil and climate adaptability, as well as their adaptability to our more popular varieties of apples.

Out of 16 familiar varieties originally tried on the extremely dwarfing rootstocks (Malling IX), only one proved to be definitely unadapted. The more early-maturing varieties bore fruit the first year. All but three fruited the second year, and a majority came into full bearing the third year. The apples were exceptionally uniform, above average size, and were more brilliantly colored, in some cases, than those grown on standard-sized trees whose names they bore.

The less-dwarfing rootstocks, from which are grown the semi-dwarf and semi-standard trees, have shown an equally wider range of varietal adaptability. They mature and bear much sooner than standard trees—tho obviously not as soon as the extreme dwarfs—and their fruit possesses the same desirable qualities. Malling I and II have so far shown the most promise among the semi-dwarfs, and Malling XIII and XVI are those excelling among semi-standards.

Some fruit specialists have called attention to the limited root systems of the dwarf trees, and have questioned their hardiness. It is naturally true that the depth and spread of the root systems vary in more or less direct proportion to the size of the trees they produce. The ability of the smaller trees to survive and flourish, where conditions of soil and climate are less favorable to horticulture, is therefore justly open to question. But since small trees do not require the sustenance and anchorage of large ones, condemnation without trial is not justified. Admittedly, many areas remain to be tested in this matter of relative hardiness.

Thus far, highly favorable reports have been received from Wisconsin, Illinois, Michigan, Ohio, Pennsylvania, New Jersey, all of New England, and from Ontario and Nova Scotia in Canada. In New York State, the trees have grown equally well on the heavier soils of the central and western parts, and on the lighter soils of the Hudson Valley in the east. In this latter region they survived last winter's temperature which ranged around 40 degrees below zero, and have withstood varying conditions of periodic drought in other areas. From this it would seem reasonable to state that they are not tender in the sense that peach trees are tender, nor perhaps as hardy, under certain conditions, as standard trees supported by other rootstocks.

Reports from commercial growers on the larger-sized dwarfs have been generally enthusiastic. Here at last are trees that can be

pruned with minimum effort, and sprayed with an economy of time and materials. Much of the fruit can be thinned and later harvested without so much time-consuming use of ladders. Still more important is the relatively short time required for the trees to reach maturity.

Many who would like to grow apples for home consumption are discouraged by the years required for the trees to start bearing. When they do bear there is likely to be a tiresome over-abundance of apples of a single variety, or no apples at all in those occasional seasons when certain trees go on a strike for no apparent reason.

For family use, the semi-dwarfs are ideal. Their top branches can be reached with hand-spray equipment, and they can be planted in odd corners of lawns and gardens without fear that they will in time outgrow their allotted space. This permits planting a greater number of varieties, not only to provide apples of different taste and appearance, but apples that will ripen at different periods during the season.

The midget trees grown on Malling IX should neither be over-rated nor under-rated. Their yield is necessarily limited by their size. Yet some varieties can be expected to produce up to a bushel. It is not uncommon to see these jeep-sized trees blooming and bearing in the nursery rows, and some of the early-maturing varieties can be depended upon to yield fair numbers of fruit in their second year.

Actually they are more like garden plants than trees, and should be treated as such. Avoid planting them where snow drifts heavily, where ice falls from the eaves, or where the wind has a clear sweep. It is a good safety measure to stake them up, at least until they have attained good growth. Fertilizer is not necessary the first year, but a quarter-pound of sodium nitrate or ammonium sulfate should be applied in the spring of the second year, and increased a quarter-pound for each year thereafter. Make the applications under the "drip" of the branches—not close to the trunk. A generous mulch of straw, hay, grass clippings, or some other easily procurable material is also advised.

At present the nursery stocks of these trees are rather limited, and under the circumstances it is perhaps just as well. The temporary shortage will limit unintelligent buying until the public is better informed. It will also curb the enthusiasm of some who might otherwise attempt too extensive plantings in regions not yet tested.

# Hay Mixtures Usually Surpass Unmixed Crop

**Condensed from The Jersey Bulletin**

THE farmer who is looking for the largest yield of high-quality hay year after year will do well to consider alfalfa-clover-grass mixture instead of straight seedings of any of the three crops, says C. J. Willard, associate agronomist of the Ohio Agricultural Experiment Station.

Nothing would add more to the general hay crop of Ohio than including Alfalfa with the long-used and justifiably popular clover-timothy mixture. Although red clover will make some growth with less lime in the soil than will alfalfa, it requires just as much lime to grow really good red clover as to grow alfalfa, and any soil which has been limed sufficiently to produce a profitable crop of red clover will also produce alfalfa. Second year meadows from clover-timothy mixtures result in thousands of acres of straight timothy which would be timothy-alfalfa mixtures, producing two or three times as much hay of better quality, if 4 to 6 pounds of alfalfa had been included in the seeding mixture.

Alfalfa is much surer to make a stand in dry seasons than is red clover, but red clover is surer to make a stand in wet seasons. By sowing both, the farmer is much more certain of hay, whatever the season. Legume-grass mixtures are conspicuously freer from weeds than are legume seedings.

A desirable mixture, which has outyielded alfalfa alone, or alfalfa or red clover with timothy, is timothy, 3 pounds per acre if sown in wheat in the fall, or 6 pounds per acre if sown in any spring crop; alfalfa, 2 to 6 pounds, 6 pounds where it is known that alfalfa is successful, smaller amounts where it is less certain; and red clover, 4 to 6 pounds, using more red clover as less alfalfa is used. Two pounds of alsike per acre may be added to this mixture, particularly on wet soils and in the northeastern part of the state.

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# Crotalaria Pays Off

Condensed from Soil Conservation

*T. S. Buie*

Regional Conservator, Southeastern Region, Soil Conservation Service, Spartanburg, S. C.

FARMERS in the South are accustomed to thinking in terms of chemical fertilizers when they think of increasing crop yields. Should someone announce the discovery of a new fertilizer in which the vital ingredient, applied only once at the rate of 5 to 30 pounds an acre, would greatly reduce soil erosion, and at the same time increase the productivity of poor sandy land threefold or fourfold, farmers would want to know where this new wonder product could be bought. They would not care about the price per pound.

No such chemical compound is available, as we all know, but many southern farmers can get the same results by planting 10 to 15 pounds of scarified crotalaria seed per acre with corn, or by sowing 30 pounds of unscarified crotalaria seed on oats in late February or early March. The crotalaria will produce a seed crop; and the mature seeds if allowed to shatter out on the ground will give satisfactory volunteer stands following the last cultivation of the succeeding row crop, or after small grain is harvested the next spring. The volunteer crotalaria furnishes excellent ground cover during the late summer and fall, produces additional seed, and provides plant residue for considerable protection against erosion the following winter.

Successive volunteer crops of crotalaria gradually increase the productivity of the land without requiring any major changes in the cropping system or fertilizing practices. Nor is it necessary to make any changes in the land preparation or cultivation of the crops with which crotalaria is grown, except in the case of corn. With corn it is a good practice to cease cultivation when the crop is about waist high as this gives the crotalaria a chance to make a good growing start and does not appear to reduce the yield of corn.

Farmers in the Coastal Plain section of several Southeastern States planted crotalaria in field trials in cooperation with the Soil Conservation Service in 1938. The plan of these simple trials included one plot in which crotalaria was planted in corn rows be-

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tween the hills of corn, a second in which alternate rows were planted to crotalaria, and a third plot in which every third row was planted to crotalaria. The crotalaria was planted on the same date as the corn so that it might produce a full crop of seed.

Cultivating the corn thinned the crotalaria considerably in the first plot as many small plants were covered by soil, but a sufficient number of plants survived to produce a fair seed crop. The other plots produced large yields of seed. The seed on all plots was allowed to shatter out and remain on the land. In 1939 volunteer stands were not as thick on the first plot as on the other two, but after the second year thick volunteer stands were established on all plots.

J. I. Lightfoot, of Troy, Ala., a cooperator of the Wiregrass Soil Conservation District, planted one of these field trials on a poor, sandy field. The volunteer crotalaria that grew in 1939 was turned under and followed by corn in the spring of 1940. The yield of corn was 21 bushels per acre, or approximately three times as great as the yield this sandy field was producing before the crotalaria was planted. Another volunteer crotalaria crop that grew after the last cultivation of corn in 1940 was turned under and followed by cotton in 1941. The cotton plants made vigorous growth and although the yield was low because of severe boll weevil damage, it was apparent that the cotton yield would have been satisfactory if the boll weevil had not interfered.

This field on the Lightfoot farm was planted to corn again in 1942 and a yield of 30 bushels per acre was obtained. Similar land nearby, where no crotalaria had been grown, produced approximately 10 bushels of corn per acre in 1942. The average corn yield for the sandy soils in this section seldom exceeds 10 bushels an acre.

Other farmers in the various States where these field trials were conducted, obtained results similar to those on Mr. Lightfoot's farm. Their crop yields have gradually increased from year to year on land where they planted crotalaria once and then went ahead with their normal cropping practices. They have been able to reduce the amount of nitrogen applied to crops following crotalaria and have not increased other fertilizers, although increased amounts of phosphate and potash might have been profitable.

These better yields of corn following crotalaria, such as were obtained by Mr. Lightfoot and other farmers in the field trials, may appear low to farmers accustomed to yields of 40, 60, or even 80 bushels of corn per acre.

It must be remembered, however, that these yields resulting from the use of crotalaria are approximately double the average corn yield in most of the Southeast. In fact, the average yield of corn in some Southeastern States is far below the cost of production.

The Florida agricultural experiment stations pioneered in research with crotalaria. The crop was introduced in that State several years ago, and in the experimental work that followed the new crop was found quite valuable as a soil builder. At the Citrus Experiment Station at Lake Alfred, crotalaria and several other cover crops were grown in a young orange grove that was planted in 1925. The increase in the cross section area of the trunks of the orange trees during the first 7 years, 1925 to 1931, under the different cover crop treatments was as follows: *Crotalaria striata,* 18.9 square inches; Natal grass, 17.8 square inches; beggarweed, 16.9 square inches; velvet beans, 15.6 square inches; clean culture, 13.3 square inches.

The total yield of fruit resulting from the different cover crop treatments during the 4-year period, 1928 to 1931, was as follows: *Crotalaria striata,* 169.5 boxes; Natal grass, 157.2 boxes; beggarweed, 135.4 boxes; velvet beans, 114.7 boxes; clean culture, 40 boxes.

Likewise, crotalaria ranked above a number of other cover crops in a 2-year rotation with corn and sweet potatoes at the Florida Agricultural Experiment Station at Gainesville. The average annual acre yields of sweet potatoes, over a period of 4 years, following different cover crops were as follows: Florida pusley, 20.8 bushels; beggarweed, 23.4 bushels; velvet beans, 26.9 bushels; cowpeas, 27.9 bushels; and *Crotalaria striata,* 38.9 bushels. The 3-year average acre yields of corn following these cover crops were: Florida pusley, 8.7 bushels; beggarweed, 12 bushels; velvet beans, 16.8 bushels; cowpeas, 14.2 bushels; *Crotalaria striata,* 16.6 bushels.

Since this experimental work, crotalaria has become the most important soil-conserving legume grown in several north-Florida counties, especially in Madison and Suwannee.

As a direct result of a few field trials in the former erosion-control demonstration project at Gainesville, Ga., in which crotalaria was seeded on small grain in the spring of 1938, several hundred acres of grain land was seeded to crotalaria in the spring of 1941. Since then this practice has spread rapidly in the Upper Chattahoochee Soil Conservation District around Gainesville. Many farmers in the district have no equipment for harvesting lespedeza and other kinds of seed, but

usually they harvest by hand sufficient crotalaria seed to plant whatever acreage they need on their farms. This makes it a particularly valuable crop for small farms without such equipment.

In the Richmond County work unit of the Brown Creek Soil Conservation District in North Carolina, the acreage of crotalaria has been expanded from 160 acres in 1936 to approximately 30,000 acres in 1941. W. B. Little, work unit leader of the Soil Conservation Service, assigned to Richmond County, reports as follows on a poor sand hill farm rented by Tebe Shepherd from Dr. F. B. Garrett in the fall of 1935.

Shepherd helped the former tenant harvest corn from 6 acres of sandy land the first autumn, and he said that they put all the nubbins from the 6 acres in two cotton sacks which then were not quite full. This field was planted to wheat in the fall of 1935 and fertilized with 75 pounds of nitrate of soda per acre in the spring of 1936. The yield of wheat was 1½ bushels per acre—4 bushels less than the amount of seed wheat planted on the 6 acres. At Little's suggestion, Shepherd planted *Crotalaria striata* on this field in 1937 and turned it under for corn in 1938. Corn, with 100 pounds of mixed fertilizer per acre, made 27.4 bushels per acre. Volunteer crotalaria that grew following the last cultivation of corn was turned under in the spring of 1939. The corn that was planted was not fertilized, yet it made 16 bushels per acre.

In 1940, 1941, and 1942, this same field was planted to wheat and fertilized with 75 pounds of nitrate of soda per acre each year. Good stands of crotalaria were obtained after wheat was harvested. Acre yields of wheat were: 1940, 11 bushels; 1941, 17.5 bushels; 1942, 21 bushels. These remarkable increases in yields were obtained with unusually light applications of fertilizers. It is almost certain that even better results would have been obtained on this poor sandy land if moderate amounts of phosphate and potash had been applied.

The use of this legume as a soil-conserving crop has been restricted to some extent because of the possibility of livestock poisoning where volunteer crotalaria plants are harvested with such annual hay crops as soybeans and cowpeas. *Crotalaria spectabilis* is known to be toxic when eaten in considerable quantity. There have been instances where the death of livestock was attributed to grazing green crotalaria on cropland in which cattle were pastured after corn was harvested in the fall.

On the other hand, it was a common sight during the fall of 1942 in Florida, Georgia, and Ala-

bama, to see cattle grazing in pastures where *Crotalaria spectabilis* was in full bloom. No harmful effects were reported. In fact, several farmers in Madison and Suwannee Counties, Fla., say they are getting more and better pasture grass where it is growing with crotalaria.

Numerous examples of farmers finding crotalaria a valuable soil-building crop could be cited, but its use has not spread as rapidly as its performance would justify. The next few years, however, should see a great expansion in crotalaria acreage.

Crotalaria is well adapted to agricultural conditions in the Southeast. There is a vast acreage of poor land that could be improved with the use of crotalaria, and moreover the percentage of land planted to row crops with which crotalaria could be grown to an advantage is very high. When a good crop of seed is produced and allowed to remain on the land, crotalaria comes in as a volunteer cover.

## Winter Dairy Pasture

Balbo rye is coming to the front rapidly as winter dairy pasture. J. M. Tatum's 23 Jerseys grazed 35 acres in McDonald county, Missouri, much of the time from September to June. When growth was slow in the colder months the cows had to be taken off occasionally to give the rye time to recover. When removed, they would go down 5 gallons a day in production, but recovered when turned back to rye.

Tatum says Balbo excels other fall-seeded grains because it will come back in a few days after stock is removed. He used 7 acres of permanent pasture to relieve the rye, but reports cattle were on the rye most of the time. After the crop had been pastured severely for most of 9 months, it yielded enough seed for 40 acres on the Tatum farm and the owner had 50 bushels to sell to neighbors. Acreage in the county and other areas in southern Missouri is expanding rapidly. In central Missouri, Roy D. Miller, who has 50 acreas of Balbo, expects it to remain good to December. He says it makes enough growth during warm periods of winter to supply considerable grazing.

—*Capper's Farmer*

# The Nitrogen Problem

Condensed from California Cultivator

*R. E. Stephenson*

NITROGEN has more natural sources of renewal in the soil than any other element. Every legume, native and wild, brings nitrogen to the soil through the micro-organisms of its root nodules. Every soil probably contains other organisms capable of taking nitrogen from the air and leaving it in the soil for plant growth. Electrical discharges in the air change some nitrogen to nitrate that is ultimately carried down to the soil by the rain. The portion of nitrogen brought to the soil by these various agencies can be only guessed, but the aggregate amount is large.

But the avenues of nitrogen loss are also numerous. Nitrate nitrogen is easily leached and large quantities are carried into the drainage water or beyond the reach of plant roots into the deep soil. Some ammonia nitrogen is probably volatilized from dry soils. Some nitrogen is reduced to the gaseous form and lost from water-logged soils. Average crops use and remove from the soil more of nitrogen than of any other element.

Nitrogen in the form of commercial fertilizer has been an expensive element to buy, usually costing considerably more in proportion to crop needs than any other element. New methods of manufacturing synthetic nitrogen fertilizers have reduced the price somewhat. With modern methods the inexhaustible air supply of nitrogen can be utilized, and there is no longer fear of a permanent nitrogen shortage for crop production but the cost can probably yet be materially reduced.

There is no way of storing any appreciable quantity of nitrogen in the soil except in combination as part of the humus. Soil humus is a fifth to a third proteinaceous matter, an essential constituent of which is nitrogen to the extent of approximately 16 per cent. That results in a nitrogen content in the humus of 5 or 6 per cent. This combined nitrogen does not leach and is not lost appreciably until freed from the humus by biological process.

Any cultural practice, therefore, which depletes humus also depletes the nitrogen supply. Some old cultivated soils have lost

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half their virgin supply of humus and likewise a similar amount of nitrogen. Any practice which renews soil humus also renews the reserve store of nitrogen. Well-known practices for this purpose are the growing of legumes as part of the crop rotation or as cover crops, returning as much of the residue of growth as possible to the land; the production and use of composts; and the use of farmyard manure. Every crop grown leaves some residue in the field to contribute toward humus renewal.

Nitrogen is the growth element and few soils supply enough for maximum growth. Resort to the use of commercial forms of nitrogen is, therefore, an essential and increasingly popular practice. The more common nitrogen fertilizers are sulphate of ammonia, nitrate of soda, nitrate of lime, calcium cyanamid, urea, ammoniated phosphate, ammonium nitrate and ammonia gas. All the various forms are good when rightly used. Some of the forms, because of their combination, supply other essential elements, phosphorus and sulphur. Some forms carry small amounts of essential elements as impurities, sometimes important to plant growth.

Nitrogen fertilizers are easy to use. Because of their high solubility in the soil and ready mobility within the plant, nitrogen fertilizers may be applied at any time in the growth period of the crop. Within a few days the effect of the fertilization may be noticed. Frequent side dressings are sometimes made to push production to a high level or to produce a crisp and succulent type of product demanded in some crops. But nitrogen fertilization without other nutrients must not be overdone or mildews and rusts are encouraged and tissue "breakdown" may result in poor shipping qualities.

While more nitrogen is perhaps the greatest need of many soils, all deficiencies must be corrected for maximum crop production. The soil supplies 11 of the 14 known essential elements, phosphorus, potassium, nitrogen, sulphur, calcium, iron, magnesium, copper, zinc, manganese and boron, any one or more of which may be deficient. Every deficiency must be spotted and corrected or the use of additional nitrogen may prove ineffective.

An abundance of essential mineral nutrients in the soil is the sound basis for effective use of nitrogen. If all minerals are sufficiently abundant any reasonable nitrogen use will likely increase production and quality of product, assuming, of course, sufficient moisture and favorable weather. When large amounts of nitrogen are to be used, several applications of small portions should be

made. It is seldom desirable to apply more than the nitrogen equivalent of 500 pounds of sulphate of ammonia an acre at one time. Application may be repeated in smaller portions two or three times or more in a season, according to needs.

Choice of a nitrogen fertilizer, assuming that several are on the market, may depend upon soil conditions. Where it is desirable to create acidity in the soil, as is sometimes the case, sulphate of ammonia and ammonium phosphate serve well. On soils deficient in sulphur the sulphate of ammonia would have a place, perhaps using lime with it if needed. Likewise ammonium phosphate is effective in supplying phosphorus. To reduce acidity, cyanamid or nitrate of lime might be used. Ammonium nitrate, urea, or liquid ammonia furnish only nitrogen and would leave no residue in the soil that would affect either acidity or alkalinity.

That element which is most seriously deficient will probably give the greatest crop increase when the deficiency is corrected. The correction of well-known deficiencies may bring out other deficiencies as a result of the large increase in production, causing a correspondingly greater demand upon the soil for other elements.

There is danger, therefore, in depending upon nitrogen alone even when the response is good. Other deficiencies may develop unless carefully observed and corrected by proper treatment and, while nitrogen is first in importance in several respects, any one or more of the other ten elements coming from the soil may become so deficient in the available form as to limit production and to prevent a satisfactory response from nitrogen fertilization.

Good economy demands that the farmer obtain as much nitrogen as possible through the use of legumes and the conservation and use of farm manure and other organic materials. Nitrogen and other fertilizers are well used when employed to grow humus materials such as cover crops to be used as green manure. Cover crop growth has been increased two to four fold by the right combination of nitrogen with other materials. The rotting organic matter provided by the cover crop effectively liberates nitrogen and all other elements essential to plant growth. No combination of nitrogen and other elements has been as effective on poor soils as when used in conjunction with compost for humus renewal and nutrient liberation.

# Food from the Farm Pond

Condensed from New Jersey Farm and Garden

*Robert A. Hayford*
Assistant Superintendent of the State Fish Hatcheries

*Lindley G. Cook*
Extension Soil Conservationist of the New Jersey College of Agriculture

DURING the next few months, soil conservation districts in New Jersey will be providing fish to a limited number of farmers who want to try "fish farming" in the farm pond. More and more farmers are asking about the possibilities of this means of getting an unrationed food supply for the family. Most of us are familiar with the way the people of Poland and other European countries have raised hundreds of tons of fish commercially on their home farm for centuries, sometimes in permanent fish ponds, sometimes in ponds formed by the flooding of level farm fields, so that fish make up one of the crops in a regular farm rotation.

Here in this country we've had spasms of talking about fish farming for many years, but we haven't taken it very seriously until quite recently—in fact, here in the Northeast very little thought had been given to the subject prior to the time there began to be some indication of a meat shortage. In the Southern states, the folks at Alabama Polytechnic Institute have done much research work in fish farming and it is to H. S. Swingle and E. V. Smith, of that institution, that we are indebted for much of the current knowledge on the subject. They have found the fish species which do best together, and they've studied the food habits of these species until they have developed a fairly standard method of stocking Southern ponds and encouraging growth of the various members of the "food chain" that lead up to maximum fish production. Well managed farm ponds in Alabama have been brought up to a production of 500 to 600 pounds of fish per surface acre—and that's a large amount of food to grow on (or in) *any* acre. However, we must not forget that Alabama has a different climate from ours so we can never expect to get the same production here as that attained in warmer climates where the growing season is longer.

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Ponds of half an acre or so should supply enough fish for an ordinary family and ponds up to two or three acres in size can be managed quite readily by the home folks. For best fish production a pond should be six or eight feet deep at some point and should preferably drop off to a depth of three feet quite near the shore. Shallower ponds are likely to become too warm in the summer, and as warm water never contains as much oxygen as colder water, the extra depth is a big help in controlling both water temperature and oxygen supply —two highly important factors in fish culture. Then, too, a deeper pond provides room for the fish under the ice in winter time. It's a big help, too, if you have a supply of running water available so fresh water can be added to the pond and so the water level can be maintained, even during periods of drought.

Large-mouth bass and bluegill (sunfish or bream) seem to be the best varieties of fish to use in the farm pond, and it is these species that are furnished to cooperators of the soil conservation districts through the courtesy of the Soil Conservation Service and the Federal Fish and Wildlife Service. The reason for this choice of species lies in the fact that these two members of the fish family are both "pan fish," both grow rapidly, both are sufficiently "game" to provide some fun for the fisherman, and, furthermore, these two species fit so well into the food chain that they provide an excellent balance of population in the pond. The large-mouth black bass, except for a very short period of his early youth, is strictly carnivorous, and eats only the smaller fish of his own or other species. He is very well satisfied with an abundance of small bluegills as a regular diet. The bluegill on the other hand, except for an equally short period of his infancy, lives almost entirely on insect larvae and very tiny forms of aquatic insects such as the daphnia. Incidentally, the daphnia provide the main food supply for the small bass and bluegills at the Hackettstown Hatcheries of the New Jersey Fish and Game Commission. The bluegill is the least cannibalistic of the pond fish—in fact he seldom eats fish in any form—and as he does not eat his brothers and sisters, a pond stocked with bluegills alone would soon become overpopulated, the result being a pond full of small, poorly nourished fish. On the other hand, a pond stocked with bass alone would not be satisfactory because the bass need a species of "forage fish" such as the bluegill on which to feed. The two species together seem to maintain a proper balance, especially when the pond is fished consistently. Prior to stock-

ing, the owner should try to find out whether he has pickerel, carp, or snapping turtles in the pond and get them removed, as they will destroy the bass and bluegills and thus prevent proper reproduction. Game wardens of the Fish and Game Commission are always willing to cooperate in the handling of this problem.

We have talked about the food which the bass and bluegills eat, but the "food chain" really starts with the microscopic plant and animal life of the pond. Without these tiny organisms called plankton there can be no aquatic life in the water because it is the plankton which form the first link in the food chain and from them all the higher forms of life obtain their living. The complete chain is as follows: Organic and inorganic fertilizers provide food for the microscopic plants; these in turn provide food for the daphnia and other insects which then serve as food for the small bass and the bluegills; the large bass eat the small bluegills. The Alabama folks have found that the watershed from which the pond water comes makes all the difference in the world in the fish population. If the water comes from well fertilized fields, there is an abundance of nutrients to support the plankton, and therefore the fish get plenty of food, but if on the other hand, the pond water comes from a watershed not so fertile, there is sure to be a shortage of plankton, with a consequently smaller fish production. The very evident relationship between fertility and fish production led the investigators to experiment with the addition of various chemical and organic fertilizers to the pond water, a process which has increased the yield of southern fish ponds tremendously. Ponds without fertilization produced fifty to 100 pounds to the acre, while fertilized ponds ran as high as 500 or even 600 pounds. These results were obtained by using fairly heavy fertilizer applications, such as annual treatment with 500 pounds per acre of a 6-8-4 mixture or 3,000 pounds of animal manures with superphosphate added, all the nutrients being applied in small monthly doses. Here in New Jersey, experience proves that we can cause serious trouble by over-fertilization, and those who seek to grow fish are urged to proceed with the greatest caution in this regard. The use of too large an amount of commercial fertilizer will often cause such a heavy growth of filamentous algae that neither the fish nor the organisms on which they feed are able to survive. Due to the high decomposition rate of organic fertilizers such as manures of various kinds, an excessive application often causes a shortage of oxygen in the water

with disastrous effect on the fish population.

At the New Jersey hatcheries, it has been found that inoculation of the pond water with the proper type of organism is highly important, the daphnia being the one that has given the best results. Light applications of fresh stable manure have resulted in greatly increased propagation of daphnia with resultant increase in fish production, but apparently no hard and fast rule can be followed to determine the required amount of manure to be used, although the color of the water is an excellent guide. The addition of just enough manure to cause a light mahogany coloring of the pond will usually give the best results after which no more need be added until the water clears. If, however, the clearing of the water is due to a cold rain or a sudden drop in temperature which causes the organic matter to settle to the bottom, no more manure should be added, lest the decomposition of large amounts of organic matter should exhaust the oxygen supply.

The fish to be furnished will be fingerlings, a description which speaks for itself, and the stocking rate will vary anywhere from thirty bass and 400 bluegills per acre, up to 100 bass and 1,500 bluegills, depending on the apparent fertility of the pond and the plans of the owner as to future fertilization. Because the fish are furnished at public expense the season and bag limits set forth in the state game laws will apply, even though the pond is entirely privately owned and controlled. The pond owner and the members of his immediate family may angle for the family dinner without the formality of a fishing license.

## Alarm Clock for Hens

A device that turns on electric lights in poultry houses at the farm Arthur J. Hannah manages in Kent county, Michigan, is a bit different from the general run of such equipment and as simple as any. The switch is thrown by a weight which is released and permitted to drop to put on lights. It hangs on a needle placed thru 2 holes as supports. An alarm clock winds the string to pull the needle and drop the weight.

—*Capper's Farmer*

# Progeny Testing

**Condensed from The Shorthorn World**

*James Douglas*

MUCH has yet to be done before the various supposedly practical means of evaluating beef cattle from an economical standpoint can be used successfully. Several methods have been tried. Some are absurd. Others exhibit signs of encouragement.

The poultryman counts and grades his eggs. The dairyman weighs his milk and determines its fat content. That seems simple enough. These processes take place normally day after day. From the findings it is possible to eliminate the loafers or retain the better performers, just as their records may dictate. But with beef cattle it is different.

Even when help was plentiful and of a reasonably competent nature, it was impractical for the farmer and stockman to operate a program that would assume the identity of a scientific experiment. Seldom are feeds weighed. Seldom does each drove of steers or group of calves receive the same feeds and treatment as those that preceded them.

Although it is little recognized, the progressive purebred breeders have done as much as circumstances will permit in favor of progeny testing. And as a consequence, herds are becoming more uniform in type, better consumers of grain and roughage. Isn't that what we're after?

Notable among those who have made contributions to progeny testing of beef cattle are the U. S. Department of Agriculture and the University of Minnesota. The former advocates progeny testing by a method that requires that feeds be weighed constantly in order to determine how efficiently they are consumed. The amount of total digestible nutrients consumed in relation to gain in body weight will be expressed as efficiency. The figure is then associated with the market grade of the animal to obtain an overall view with respect to daily gains, efficiency of feed consumption and market grade.

It is generally known that nursing calves are extremely efficient in the consumption of feeds. Young calves have been known to gain upwards of 40 pounds in body weight for each one hundred pounds of total di-

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gestible nutrients consumed. A yearling steer that gains as much as 18 to 20 pounds per one hundred pounds of digestible nutrients has done very well. Older steers are less efficient in the consumption of their feeds.

The Department of Agriculture conducted tests with beef calves before weaning and after weaning. Finally it was decided to place the calves on test when they reached a weight of 500 pounds and to keep them on experiment until they weighed 900 pounds. The nursing calves received a ration of four parts by weight of corn, three parts of oats, two of wheat bran and one part of protein meal, along with good quality legume hay. When they reached 500 pounds they received a ration of corn and alfalfa hay. The steers soon tired of this ration, especially after having become accustomed to a well balanced ration that offered variety. They made poor gains that reflected their dislike, especially in the latter portion of the feeding period. Quite some time later their corn and roughage ration was abandoned in favor of one that more nearly approached that to which they had become accustomed before they were weaned. Much better results were obtained and a more nearly accurate picture of efficiency developed.

Unless an animal is given every possible opportunity to make a normal or average development, efficiency cannot be obtained. In other words, if feeds are poorly balanced and unpalatable and feeding conditions are not suitable, an efficiency that would be considered undesirable under normal circumstances could very easily be developed. After all, if we are to adopt efficiency of gain as a barometer of economy production, then it is imperative that we know just how efficient a calf or a yearling or a two-year old must be if we are to break even under normal conditions. To my knowledge, such information has never been disclosed.

The government workers found that the performance of a calf before weaning had no significant bearing on what to expect of it after weaning. That seems odd to me. I'd like my calves to do well from the very beginning.

Let's take the case of the breeder who produces his own calves and elects to feed them to a weight far in excess of the normal weaning weight. The expenses that accrue during the nursing period are of much concern to him. Conditions might well be such that any profits that may be realized after weaning could have been consumed before the calves are taken from their dams.

When we consider gain in weight we must also take into

account the nature of that gain. Was it mainly in the form of growth or was it a combination of growth and fattening? The former is obviously least expensive in feed costs, but most expensive in market grade. Efficiency of grain would favor growth and penalize fatness. Is that what we want? Not to my mind. How efficient must a steer be that has been retained until he reaches a weight of 1200 pounds or more? Couldn't such information be graduated into weight groups? We all realize that as an animal gains in weight beyond the calf-hood stage it becomes gradually less efficient. How much of this can we stand when feeding and market conditions are average to below. It would be well to have such information based on a rather mediocre outlook insofar as the feeder is concerned.

When feeding conditions are favorable and markets in decent shape, most any beast will hold his own. Under those conditions many inferior steers have been fed and have shown a reasonable profit. What happens when the feeder returns to the same source for another drove of steers—when market conditions are unfavorable and when feed costs have advanced. Seems to me that's the sort of thing we want to eliminate.

It would be interesting to know whether cattle that make rapid gains on rations composed largely of concentrates would do likewise if fed a ration largely of roughage. Many steers are fattened on grass. Some receive grain or protein concentrates toward the end of the feeding period. Others are fattened on grass alone.

At the University of Minnesota daily gains and market grade were used in finding the superior performers. There are some steers, however, that will eat the crib down in preparing for market. Such information has been found in the government experiments.

It has been my belief that the main purpose of purebred stock is to improve the type, quality and efficiency of the masses of inferior cattle. It doesn't follow, however, that simply because an animal possesses a pedigree it is automatically a superior beast. Only a small portion of the bovine species is registered. Only a small fraction of prime beef comes to market.

Some years ago the veteran feeder, Ed Hall, decided to put the best steer of his champion carload into the open steer competition at Chicago. The steer failed to place and yet, he was a prime steer by market classification. When the champion steer is sold and possibly the reserve champion, those that follow bring little more if any than other prime individuals. And yet, there

frequently exist hair-line decisions in determining a champion or a class winner.

Most champions are purchased at high prices for publicity purposes. Class winners sell with the run of the mine insofar as prime steers are concerned. It seems to me that the only parties who appreciate fully the value of outstanding individuals are the purebred breeders. If you differ, send an excellent steer to market, one that is a show prospect, along with a group of fat steers.

Students of animal breeding have been recommending inbreeding and line breeding in recent years. Ironically enough, progressive purebred breeders have been following these practices successfully for years. And there is evidence that such practice is becoming quite general.

When a calf is given every opportunity to develop and when those that don't respond are disposed of, it seems to me that a progeny test is in operation. Breeders have been following that practice for some time.

By their continuous production from one generation to another of outstanding individuals, purebred breeders are assembling uniform herds of high quality.

When mistakes in feeding or in breeding are made, it is at the expense of the feeder or breeder. That sort of experience is conducive to learning and to progress.

## Best Garden Fertilizer

Best tonic for a puny garden, for the shrubs and flower beds and even the lawn is organic matter. In some respects it is better than barnyard manure because it contains more nitrogen, more phosphorus and more lime and no living weed seeds.

This artificial manure is made by collecting straw, leaves, cornstalks, garden refuse, lawn clippings or any other vegetable matter, piling it in layers and sprinkling each course with a reagent. The reagent is composed of 45 per cent ammonium sulphate, 40 per cent finely ground limestone or hydrated lime (sold in bags by lumberyards) and 15 per cent superphosphate (the 20 per cent kind). Apply the mixture to the refuse at the rate of 150 pounds a ton, or 500 cubic feet of material. Put down a 10 foot square layer 1 foot thick, sprinkle it with water and then scatter over it 30 pounds of the reagent. Repeat until pile is complete. Stack the material low in the center to take water. The manure should be ready to use by spring if the heap is prepared before cold weather sets in. A ton of air-dry material will make 4 tons of good manure.

# Grows All His Dairy Feed

**Condensed from Capper's Farmer**

DAIRYMEN who follow Therl Jackson's management system don't have to worry about being caught short of protein or grain. Jackson grows all the feed consumed by his high-producing Holstein herd in Grant county, Indiana—mixed clover and alfalfa, Sudan, bluegrass, for pasture; corn and oats for grain; alfalfa and grain-type soybeans for hay. Such pasture and hay provide most of the protein needed. Jackson grows soybeans to grind with his grain to supply the balance, and it never is necessary to use more than a pound of soys to 7 of grain. The mixture is fed at the rate of a pound for each 4 pounds of fat a cow produces in 30 days.

The Holsteins convert such farm raw materials as grass, grain and hay into a finished product, whole milk. In a recent 10½-month period, each cow in the herd made $90.89 worth of feed into human food that sold for $221.22. In a full testing year when milk and feed prices were not as high as now, the cows, plus the owner's labor, made $1,606.52 worth of feed into milk that brought $4,288.69. Average production was 469.7 pounds of fat a cow.

Since his feed is home-produced, Jackson's best way to cut costs is to reduce the amount of labor needed. That is done by making cows harvest much of their own feed 7 months of the year. He provides 3 varieties of pasture, and when the cows walk up to the gate and seem to want another kind, he opens it and turns them in. Use of forage variety, he believes, is one of the best ways to keep production high. He provides 6 acres of Sudan as night pasture, 14 of alfalfa-clover for daytime, and 40 acres of bluegrass as variety and to lengthen the grazing season at both ends.

Rotation grazing makes it possible to keep the Sudan down so it remains high in protein and to manage legumes so as to maintain a stand and get maximum yield. The management practice followed keeps grass so nutritious that protein supplement is not needed during the pasture season. Alfalfa is cut while it is high in protein, and extreme care is used to save all leaves. The grain-type soybean hay is permitted to stand as long as possible without leaf loss so that beans will be well developed.

Jackson produces his own cows

as well as feed. In 22 years he has bought but one. Heifers from the best cows are held and tested; replacements are selected from those with highest records. This system helps prevent introduction of disease from herds not so carefully managed. Herd quality has been bred up to a point that bull calves, under 2 months old, will bring $50 each.

# How Many Pigs?

**Condensed from Ohio Farmer**

*Howard Davison*

**Ohio State University**

SEVERAL years ago I bought two registered bred gilts at a breeder's sale. I didn't expect to buy anything at the sale, only went out of curiosity. However, in looking over the offering I noticed two gilts that were quality gilts of medium type, and I just had to have them whether or no.

One farrowed on a cold night in early March and I was all ready with sacks and a basket so that the litter wouldn't get chilled, but the litter turned out to be twins. My enthusiasm cooled a little, but I assured myself that the other gilt would make up for it. She farrowed the next night and presented me with triplets but the first laid on one of hers so I had four pigs from my two gilts.

Of course there are a lot of factors that determine how many pigs a sow is going to raise such as: 1. Size and strength of the pigs farrowed, which can be varied by such things as feed, exercise, and condition. 2. Ability to nurse the pigs properly, which may vary because of feed, care or inheritance. 3. Number of pigs accidentally killed by failure of the owner to provide proper protection in the form of guard rails or pig hovers. 4. Pigs lost by disease or parasites.

All of the things above are important but the most important factor is for the sow to farrow

**Reprinted by permission from the Ohio Farmer**

large litters. You can't raise them if she doesn't farrow them. The time to determine how many pigs your sows will farrow is right at breeding time, or for a relatively short period just before mating. The ability to farrow large litters is inherited and this implies that we know something about the background of each sow and boar we keep in our herd. If the boar is fertile he has little effect on the number of pigs farrowed as a result of the matings, but he will have a noticeable effect on the number of pigs his gilts will farrow.

In selecting gilts take only those that are of good type and that have been produced by sows that raised one or more large litters of thrifty pigs. If you do not have records of your own herd it will probably pay to purchase gilts from some herd that does keep records, It takes between 25 and 30 bushels of grain to keep the average brood sow for one year and since the major portion of this feed cost must be charged to the pigs, you can afford to pay a substantial premium for gilts with records.

Here are a few other points to consider but they are rather minor when compared to the factor of inheritance.

*Size*—gilts should show the growth factor or the ability to make rapid and economical gains. I would certainly hesitate to select any spring gilt that weighs less than 200 pounds at breeding time.

*Quality*—absence of heaviness or coarseness in the head, ear, jowl or shoulder, and freedom from wrinkles.

*Constitution*—indicated by general vigor and by roominess of middle, width of chest, and a good heart girth.

*Type*—stick to the present meat type, the kind that will finish at 180 pounds, but can be carried to 250 pounds without having an excess of gobby fat. The packer wants a hog with a thick meaty back and loin; a ham that is plump and filled out clear down to the hock; a long, deep, smooth side and front end that is trim and neat. There are a few other things that are important such as feet and legs and udder development. The legs should be on the corners and should be straight. If the legs are crooked, or the pasterns long and sloping, it is only a matter of time until the sow has a hard time in getting around.

The underline should be long with a well-developed udder and there should be at least 10 or preferably 12 well-spaced teats.

In addition to the selection of the proper kind of brood sows there are some management practices during the breeding season that help determine "how many pigs." Flushing will increase the

number of pigs farrowed when it is used on a sow herd that is out of condition. In practical, everyday use, flushing is accomplished by increasing the amount of feed, provided it is a balanced ration. A popular flushing ration is to have sows and gilts on legume pasture, with liberal amounts of a ration composed of 65 pounds corn, 25 pounds wheat or oats, and 10 pounds tankage or 40% protein supplement. This should be started about two weeks before the mating.

Purdue University has kept a complete record of all the sows in their herd since 1921. In 1938 they published the results of 722 spring litters and some of the figures are astounding. We see, for instance, how important it is to have big husky pigs farrowed:

| Birth Wt. of Pigs | Weaning Wt. of Pigs | Percent Weaned |
|---|---|---|
| 1.50 lbs. | 18.4 lbs. | 13% |
| 2.00 lbs. | 21.0 lbs. | 49% |
| 2.50 lbs. | 24.5 lbs. | 67% |
| 3.00 lbs. | 27.5 lbs. | 77% |
| 3.50 lbs. | 30.2 lbs. | 85% |
| 4.00 lbs. | 34.7 lbs. | 84% |

The pigs that weighed less than two pounds at birth just didn't have much chance of pulling thru, but those weighing over three pounds got along pretty well. One answer then to the high mortality problem is to have all pigs weigh over three pounds when they are farrowed.

# Returns from Pasture Treatments

**Condensed from New England Homestead**

*Charles B. Creek*

PASTURE records for the 1942 season showed that returns were highest for fertilized Ladino clover pastures and lowest for untreated native grass. High quality pastures will substitute to some extent for grain as shown by records for these farms. On two farms the ratio of grain fed to milk produced was 1 to 7 and production was 27 pounds of 3.8% milk per cow per day during the pasture season. On four other farms where grain feeding was continued at a high rate (1 to 3 ratio) during the grazing season milk production was practically the same rate. In addition hay, silage, and green feed were fed on the latter farms at a higher rate. Too many dairymen do not use their improved pastures to the best advantage as shown by these records.

Returns were calculated in cow-days of grazing, pounds of 4%

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milk produced, and tons of forage grazed for all types of pasture. Relative returns by types of pastures are shown in the table together with total acreage. Returns in pounds of milk produced from grazing on Ladino clover were much greater than for other pastures. These pastures had all been seeded since 1938 and almost one-half the acreage was a one-year stand which was very productive. Clover and grass pastures were second rank in returns and consisted of old hayland, recent pasture mixture seedings and some fields of native grass where white Dutch clover was growing after a topdressing of lime and fertilizer. The third type of pasture was older seedings where clover had died out and permanent grassland which had been fertilized.

Of the annual pasture crops, millet and sudan grass in late summer brought highest returns with 3570 pounds of milk per acre while oats and rye pasture produced grazing for about 2200 pounds. Returns from rowen pasture were reduced because grain feeding was at a higher rate. The returns from native grass pastures illustrate what can be expected from the ordinary untreated grassland on many dairy farms.

When present costs for seed, lime, fertilizer, and labor on Ladino pastures were calculated and deducted from the value of milk actually produced on pastures (after cost of grain and roughage were taken out) the net returns per acre were about $60. For clover and grass pastures this return was about $45 and for annual pastures it was $25. For the native grass pastures the comparable return was $10 per acre after grain and hay costs were deducted. This comparison shows the extra returns from the various types of improved pastures over the ordinary untreated grass pastures.

Cash costs for seeding an acre of Ladino clover were calculated on the basis of 1942 prices at about $33 per acre. This consisted of 20 pounds of pasture mixture plus two pounds of Ladino clover, 1.5 tons of lime, 700 pounds of superphosphate and 450 pounds of potash fertilizer per acre. The value of manure (usually 15 tons) used and the cost of labor for plowing, seeding, etc., were additional expenses. Topdressing treatment in later years was of two types. First was the application of complete fertilizer in 1942 at the rate of 700 pounds per acre of 10-10-10 or 7-7-7 fertilizer. Other farms used a combination of manure at 15 tons per acre, superphosphate at 400 pounds and potash at 200 pounds.

The costs for clover and grass pastures were usually somewhat

lower for both seed and fertilizer. Topdressing followed the same pattern as for the Ladino clover pastures, except at lower rates. Grass pastures were topdressed with 350 pounds of complete fertilizer and 400 pounds of superphosphate plus manure. Rowen was treated with complete fertilizer when the stand was chiefly grass and with superphosphate and potash when there was much clover. Annual pastures were generally nurse crops for new seedings of pastures without extra treatment, but millet and sudan grass were fertilized with 10-10-10 at the rate of 200 pounds per acre.

A comparison of returns for 1941 and 1942 showed that the length of grazing season averaged 121 and 135 days. Pounds of milk per acre from Ladino clover were 3044 and 6114, respectively. There was less difference in relative returns for the grass, annual, and rowen pastures. The average returns for all types of improved pastures were 2385 pounds of milk in 1941 and 3940 pounds in 1942.

**Returns in 1942 by Types of Pastures**

| Kind of Pasture | Total Acres | Lbs. 4% Milk per Acre | No. Cow-days per Acre | Tons Forage per Acre |
|---|---|---|---|---|
| Ladino Clover | 83.75 | 6114 | 176 | 5.8 |
| Clovers and Grass | 53.75 | 3940 | 110 | 4.0 |
| Grass Mixtures | 33.5 | 2664 | 84 | 2.4 |
| Annual Crops | 32.75 | 2526 | 56 | 2.7 |
| Rowen | 37.5 | 1452 | 31 | 1.3 |
| Native Grass | 33.5 | 839 | 23 | 0.7 |

Eastern States Farmers Exchange pasture and grazing records for farms in Worcester and Middlesex Counties, Massachusetts

# Mungbeans—Alfalfa Substitute

**Condensed from Farm and Ranch**

THE production of enough protein feeds for dairy cows will be one of the most important problems of farmers next year. While alfalfa is the best legume hay, areas where it can be grown in the Southwest are limited. As a substitute for alfalfa, the mungbean has been found to be almost as good as alfalfa, and with several advantages in crop production not found with alfalfa or other of the legume hays.

Tests on the feeding value of mungbean hay, made for several seasons by the Oklahoma Agricultural Experiment Station, show considerable promise for feeding dairy cows. When considering the hay actually consumed by cows, the feeding value of mungbean hay and No. 1 alfalfa hay were practically the same, but a part of the coarser stalks of the mungbean hay were not eaten by some of the cows and reduced the value of the hay by that amount. Farmers count only the part of a crop that is actually used for milk production.

Even on this basis in each of two trials, 133 pounds of hay made from a variety called Golden mungbean replaced 100 pounds of No. 1 alfalfa hay. This would give a feeding value of about 75 per cent in comparison with alfalfa. Using the finer stemmed mungbean hay, however, lowered the amount required to replace 100 pounds of alfalfa to 114 pounds of the mungbean hay. This raised the feeding value of the mungbean hay to about 87 per cent of that of alfalfa.

The best quality of mungbean hay was obtained when beans were cut in the morning of a clear day soon after the dew had disappeared; then the wilted beans were piled in small cocks that afternoon or the following morning. These small piles were left in the field about a week, then baled in the field. Like alfalfa, the main feeding value is in the leaves and any procedure in harvesting which will prevent the loss of leaves is best. It was found that shattering occurred less and the amount required to replace the hay in small piles rather than in the swath. Another means of preventing loss is to bale the hay in the morning because the hay becomes brittle later in the day.

Oklahoma dairymen who have grown mungbeans report several advantages in them. Mungbeans produce fair yields even in thin

**Reprinted by permission from Farm and Ranch, Oct., 1943**

upland soils where other legumes will not grow. This indicates considerable merit in producing annual or emergency hay crops of high feeding value. They grow rapidly and withstand drouth and hot weather, making a fair crop with scant rainfall. The green variety reaches the cutting stage in 60 to 70 days after planting which makes it an excellent emergency hay crop to follow on a piece of land after the grain is harvested. Another advantage which has been reported and should not be overlooked is that jack rabbits will not eat the young, tender plants as they do some other crops.

The mungbean is not a new crop here. It was introduced to American agriculture over a hundred years ago and has been kicked around from one experiment station to another; and even with much testing it never seemed to make much of a showing in competition with the cowpea and soybean. Old-timers will probably remember the bean as Chickasaw pea or Oregon pea as it was formerly called. As a food crop, the mungbean will probably never compete with common field beans and peas, but it finds considerable use as sprouted beans. The canned sprouts have found a good market.

In spite of the poor start which mungbeans made, it remained for the Oklahoma Experiment Station to discover their value as legume hay and to test their value under growing conditions of the Southwest.

# Lubricating Farm Machinery

**Condensed from The Michigan Farmer**

*Paul R. Hoff*

THE length of life and freedom from trouble of any farm implement is determined largely by the lubrication it receives. The expense and the time invested in good lubrication pay large dividends.

In addition to maintaining a lubricating film between the bearing surfaces, the oil or grease that is used on farm implements performs several other functions:

1. *Cleans the bearing.* A bearing that is filled with clean, fresh lubricant does not contain dirt, grit, moisture, or other objectional particles that may harm the bearing surfaces.

2. *Prevents rusting and pitting of the bearing when the machine is idle.* A machine allowed to stand idle without being properly lubricated may collect moisture in the bearings. This causes the bearings or the shaft to become rusted and pitted.

3. *Protects exposed metal surfaces during storage periods.* Unpainted metal parts of implements can be protected by coating them with transmission grease or chassis lubricant. Crankcase oil or even new motor oil does not always give enough protection against rust for more than a short period.

### Keep Oil and Grease Clean

Clean each fitting before lubricating. The purpose of lubrication is to fill the bearings with fresh clean lubricant. This can be done only if the containers are kept covered to exclude dust and dirt and if oil cans, grease cups, and grease guns are refilled under clean conditions.

### Lubricants

Four different oils or greases meet the lubrication requirements of nearly all farm implements. Usually not more than two lubricants are needed for any one implement.

The various grades (viscosities) of oils and greases are designated by SAE (Society of Automotive Engineers) numbers. Lower numbers mean lighter grades; SAE 10 motor oil is lighter than SAE 30 motor oil and SAE 90 gear oil is lighter than SAE 110 gear oil. Machines operated the year around may require lighter oil or grease for winter than for summer.

*Oil.* For oil holes or oil cups, SAE 30 or 40 motor oil is used in warm weather. Badly worn

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bearings may need a heavier oil that is not thrown out so quickly. Oil of the same viscosity as is used in the tractor motor usually is suitable. Used crankcase oil may contain grit, bits of metal, or other harmful material, and may harm the bearings. It should not be used to lubricate farm machinery until the abrasive material has been allowed to settle out.

*Cup grease.* Cup grease is designed for use in grease cups and is relatively stiffer than chassis lubricant which is made for use with grease guns.

*Pressure-gun grease.* Grease known by the trade name of "chassis lubricant" is made for pressure-gun lubrication. Chassis lubricant that is of a "sticky" consistency clings to the bearing surfaces better than any other. It is an all-weather lubricant.

*Gear oil.* SAE 90 gear oil usually is recommended for enclosed gears. The viscosity oil can be used in all gear cases unless the manufacturer's recommendations are otherwise.

### Methods of Lubrication

*Oil holes.* A small amount of oil applied frequently gives better lubrication and wastes less oil than does a large amount applied once or twice a day. On slow-moving horse-drawn implements, lubrication through oil holes is satisfactory if oil is applied often. The practice of going over the implement with the oil can each time the horses stop for rest has undoubtedly prolonged the life of many farm tools. When horse-drawn implements are operated at speeds higher than they were designated to be run, as behind a tractor, oil holes may not furnish enough lubrication unless more frequent stops are made for oiling.

Oil holes that are exposed to dust and dirt may need to be cleaned each time the machine is oiled. Clogged oil holes must be cleaned with a wire or a nail before any oil will go through. Frequently, oil holes are hidden by dirt and are overlooked. The instructions that came with each machine should be followed, if they are available, so that no oil holes are missed. Usually there are two bearings for each moving shaft, and they should be found and oiled.

*Grease cups.* When grease cups are used to force lubrication into exposed bearings, the cup must be turned down enough to force fresh grease out of both ends of the bearing. Because of the limited amount of pressure from grease cups, dirt and old grease may not be forced out of the bearing if the caked grease is allowed to obstruct the fitting. Therefore, they should be cleaned occasionally.

*Pressure gun.* Grease should be forced into the bearings until all

the old grease is forced out and the fresh grease appears at both ends of the bearing. A hand-pressure gun is capable of several hundred pounds of pressure which is enough to force gummed grease and dirt out of the bearing and to fill it with fresh grease.

*Enclosed gear cases.* Manufacturers recommend that the oil or grease be changed at least once a year. At the time the oil change is made it is advisable to wash sludge, grit and bits of metal out of the case with kerosene. If the cover of the case must be removed to change the oil, it is good practice to use a new gasket when the cover is replaced. The advantages of an enclosed gear case are reduced greatly or even made of no value if the oil can leaks or dirt can get in.

*Lubrication of exposed gears and chains.* Wherever gears or chains are exposed and operate in dust, satisfactory lubrication is practically impossible. Less wear may result if they are run dry. Dust may combine with the lubricant and form an abrasive, causing excessive wear.

If drive chains are lubricated, they should be removed periodically and washed in kerosene. They can then be dipped in light motor oil and allowed to drain before they are replaced.

Small exposed gears may be lubricated with light motor oil. A light oil usually does not collect enough foreign material to interfere with the operation of the gears. They should be washed off with kerosene and a brush to remove abrasive grit and old oil.

*Lubrication of universal joints.* Universal joints that have pressure fittings require either chassis lubricant or fiber grease. The manufacturer's recommendations should be followed.—From Cornell Extension Bulletin

# How to Establish and Maintain the Farm Flock

Condensed from Sheep Breeder

*W. G. Kammlade*

Chief in Sheep Husbandry, University of Illinois

THE natural breeding season of sheep is in the fall of the year, from about the middle of August to the end of December. Ewes of the Dorset breed or grade and crossbred Dorset ewes and some fine-wool ewes will breed earlier than this or at other seasons. However, for most farmers in Illinois it is impractical to start breeding the ewes before the middle of August. The periods of heat last about one day and recur approximately every 16 days. The gestation period (the time from breeding to lambing) averages 147 days.

Altho the lambing season is frequently called the "shepherd's harvest," the character of the crop depends largely upon proper care and feeding during pregnancy, assuming that the flock is made up of desirable individuals.

It is generally considered advisable to flush the ewes before the beginning of the breeding season. This consists of giving them some grain in addition to pasture or of placing them on more nutritious pasture than they have had during the summer, so that they will be gaining in weight when bred. It is not expensive to flush ewes. It can be done by feeding each ewe ½ to ¾ pound of grain daily for about a month. Altho natural prolificacy is undoubtedly important in determining the number of lambs a ewe will drop, experimental work and observations of practical sheepmen indicate that flushing, either with grain or pasture, increases the number and may have other beneficial effects.

Ewes should be kept in thriving condition at all times, and flushing just before breeding should not be considered a means of overcoming poor feeding and management at other seasons.

The ram will be most active if in medium flesh during the breeding season. If of medium size, he should receive at least a pound a day of some grain mixture, such as 3 parts of oats and 1 part of

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wheat bran, by weight. If he is very heavily wooled he should be sheared or the wool on his belly clipped short before he is turned in with the ewes.

All rams are not equally fertile at all seasons of the year. Some settle ewes readily during summer and early fall; others are almost sterile at these times and become highly fertile only late in the year. This may be true even with rams that are very active. Altho some very fat rams are fertile, there is positive evidence that extremely heavy feeding and high fitting is harmful in some cases and in all cases is a wasteful practice.

The breeding season calls for attention to some details. Among the things to do at that time is the removal of tags (large locks of dirty wool) which may have accumulated about the rear quarters of the ewes. Good caretakers, however, remove these tags from time to time as they are accumulating and the task at breeding time is not difficult.

While the feet of sheep may need to be trimmed from time to time to prevent excess growth and lameness, it is especially important that the feet of the ram be in good shape at the breeding season. The feet of sheep may be trimmed with a knife. A small pruning knife is often recommended. The hoof is much easier to cut if the work is done after the sheep have been on wet pastures or damp ground for a few hours.

Since ewes do not show so plainly as other farm animals when they are in season, effort should be made to learn whether they are being bred. This is especially necessary if only one ram is being used. In a number of cases none of the ewes in a flock dropped lambs because the ram was sterile or did not serve the ewes. The oestrus (heat) period of ewes occurs at about 16-day intervals. A simple way of knowing whether or not ewes that have been bred are returning in heat is to have the ram with them for a 16-day period, during which time most of the ewes should have been bred. At the end of this 16-day period some thick paste, made of used oil and red ochre, is placed on the ram's brisket between his front legs. This will need to be applied every day or so during the next 16 days. This will leave a red mark on each ewe bred during the second 16-day period. For the next period, lampblack can be used in place of the red ochre, so that those ewes bred during the third 16-day period will have a black mark on the rump. If all the ewes are again bred, without effect, it is doubtful if the ram is a breeder and a new one should be secured. When more than one ram is being used, or if the caretaker is giving the

flock very close attention, such as in the case of purebred flocks, the use of the marking material will not often be necessary.

A notation regarding the date the ram was turned with the flock, or the period when most of the ewes were bred, is helpful in preparing for the lambing season.

During the gestation period many farm flocks are so neglected that very poor lambing seasons follow. Thruout this period ewes should gain in weight so that they will be in good condition to nurse their lambs well. This means that the ewes must be given feeds which contain the nutrients needed to maintain their own bodies, to grow a fleece, and to develop the fetus. Not only must the feeds be suitable, but other phases of management should be adapted to the needs of the ewes. When properly handled, bred ewes seldom become too fat.

After the breeding season for early lambs there is a period of about eight weeks before it is necessary to put the ewes on winter rations composed largely of harvested feeds. Pasture feeding during this part of the fall and, in some sections of the state during at least a part of the winter, will help to keep feed costs down.

To have good pasture for this period, stock should be removed from these areas during earlier parts of the season. Bluegrass or redtop pastures handled in this way and allowed to grow about 4 to 6 inches high before the sheep are turned into them will furnish palatable feed during a large part of the winter in many areas of the state. Such cereals as rye, wheat, and winter barley make excellent pasture where soil conditions permit. If seeded in September they are likely to make the best pasture. Except when these crops are grazed too closely, the reduction in grain yield will not be great and it will likely be offset by the value of the pasture.

During severe weather the ewes should of course be protected. At other times they can be made to gather a portion of their feed, as this assures some exercise, a great aid in maintaining vigor and health.

# Disease Control with Chloropicrin

Condensed from Market Growers Journal

*M. L. Odland*

Asst. Prof. Vegetable Gardening, University of Connecticut

AN experiment designed to evaluate the effectiveness of chloropicrin as an agent for soil sterilization has been carried on for several seasons at the Storrs Agricultural Experiment Station, University of Connecticut, Storrs, Conn. Preliminary work indicated that in some instances an increased yield had been obtained on chloropicrin treated soil as a direct result of disease control. In other instances increased yield had been obtained in the absence of any apparent disease control.

In 1940 a series of three plots was treated with chloropicrin at the rate of 1cc, 2cc and 3cc per square foot. These plots, as well as a check plot, were planted to vegetables for observational purposes. In 1941 a similar series of plots was treated in an identical manner. Thus, two series of plots were available for planting, one series treated the previous season and the other treated the current season. The area of sandy loam soil selected for the study had received annual applications of barnyard manure and commercial fertilizer and thus was in good productive condition. The land was plowed and harrowed previous to the chloropicrin treatment. Undiluted chloropicrin was injected into the soil to a depth of four inches. In 1940 the treatment was applied twelve days prior to planting; in 1941 the treatment was applied three weeks prior to planting. The crops grown included eggplants, tomatoes, peppers, snap beans, sweet corn and cabbage.

In 1940 the weather from the time of treatment until planting was rather cold and wet. Under such conditions twelve days proved to be insufficient time for the gas to escape from the soil, and as a result there was considerable treatment injury in the germinating crops, especially where 3cc per square foot was applied. Replanting the injured crops approximately a week after the original planting date resulted in a good stand with no injury. Evidently three weeks was sufficient time, even with cold wet soil, to allow the gas to escape from the soil. In 1940 the treated plots produced significantly greater yields of tomatoes and

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eggplants than the untreated plots. Wilt disease was prevalent in the untreated eggplant plots. Almost perfect control of this disease was obtained by the gas treatment. No apparent disease control resulting from the treatments was noted in the other crops.

In 1941 no injurious effects to germination resulted from the treatment. To facilitate the escape of gas from the soil the land was harrowed a week before planting as an extra precaution. At planting time the weather was warm and the surface of the soil was fairly dry.

The yields of the several crops are given in the table. A great increase in yield of eggplants was obtained by the chloropicrin treatments. The untreated or check plot produced only 1.7 pounds of fruit. Yields of 4.8, 5.3, and 8.8 pounds were obtained on the 1cc, 2cc and 3cc treated plots respectively. Thus the plot which received 3cc per square foot produced more than five times the number of fruits produced by the check plot. In this instance, as in the previous year, the increased yield was primarily due to control of wilt. The plants in the check plots were badly wilted, whereas the plants in the treated plots showed little or no disease, the control progressing with the increase in dosage. The residual effect of the treatment may be noted by comparing the yields obtained on the plots treated the previous season. On this series of

**The Effect of Chloropicrin Soil Treatment Upon Crop Production**

| Time of Chloropicrin Application | | Yield per plot in pounds | | | |
|---|---|---|---|---|---|
| | | Check | 1cc | 2cc | 3cc |
| Previous Season | Eggplant | 1.8 | 2.6 | 4.6 | 6.2 |
| Current Season | | 1.7 | 4.8 | 5.3 | 8.8 |
| Previous Season | Pepper | 3.2 | 3.3 | 3.4 | 4.4 |
| Current Season | | 3.8 | 4.5 | 4.4 | 4.3 |
| Previous Season | Tomato | 1.8 | 1.8 | 1.7 | 1.7 |
| Current Season | | 3.2 | 5.3 | 19.6 | 12.2 |
| Previous Season | Wax Snap Beans | 3.1 | 3.7 | 3.3 | 2.7 |
| Current Season | | 1.7 | 4.7 | 3.7 | 2.8 |
| Previous Season | Snap Beans | 1.4 | 1.7 | 1.7 | 1.4 |
| Current Season | | 1.2 | 1.9 | 1.3 | 1.3 |
| Previous Season | Sweet Corn | 3.3 | 3.4 | 3.2 | 2.8 |
| Current Season | | 2.7 | 3.8 | 3.4 | 5.1 |
| Previous Season | Cabbage | 10.5 | 3.0 | 10.6 | 7.8 |
| Current Season | | 5.1 | 11.3 | 10.5 | 10.0 |

plots also, the treated plots outyielded the check, with progressive increase in yield with increase in dosage. Effect of the treatment was reflected in number of fruit also; the range was from an average of .5 fruit per plant in the check plot to 1.7 fruits per plant in the 3cc treated plots. Further treatment effect was found in size of plant; treated plots had a much greater amount of foliage.

Only a slight effect of the treatment was noted in the pepper plots. The foliage appeared slightly more abundant on the treated plots, but significant differences in yield were not obtained.

The treatments increased the yields in the tomato plots. The check plot yielded 3.2 pounds while yields of 5.3 pounds (1cc), 19.6 (2cc) and 12.2 (3cc) were obtained on the treated plots. There was no apparent disease control and yields differences may be attributed, as suggested by other workers (1) (2), to the injurious and competitive micro-organisms in the soil. The previous season's treatment had no effect on yield.

The treatments showed slight or no effect on the snap bean crops. Perhaps a slight beneficial influence on yield of sweet corn was obtained with the 3cc injections. The smaller injections apparently had little or no effect.

Cabbage yields were increased somewhat with gas treatment, apparently because of partial elimination of injurious and competitive micro-organisms in the soil. No residual treatment effect was noted in the cabbage plots.

No difficulties were experienced in applying the chloropicrin with an automatic injector. For experimental control of micro-organisms the method should prove useful, and possibly it may prove feasible for use as a general field treatment.

# Where Guineas Reign Supreme

**Condensed from Better Farms**

SOME men plan for a career in agriculture. Others are born to it. But Gordon P. Gleason became a farmer on impulse—and is doing nicely in a realm few have investigated. For in the seven years he has been farming, Gordon Gleason has built Totem Farm at Meridale, N. Y., into a world-famed institution for the breeding and raising of Guinea chickens.

Gordon Gleason was born in Albany, son of the late Republican tycoon, Lafayette B. Gleason. He spent his boyhood in Delaware County, was educated at Manlius Military Academy and at the Pawling School. He could have had his choice of careers, but he elected a career in journalism.

He became a criminal courts reporter for a metropolitan daily and covered some of the most famous trials of this generation. Later he became private secretary to the then district attorney. He became publicity director of the State Barge Canal Commission and other bodies, qualified as an authority on transportation and was editing the Tariff Review when he was struck by the impulse to chuck it all and to go back to the boyhood scenes he was remembering with increasing nostalgia.

Somewhere along the line of his checkered career, he had picked up a love for birds and had made a study of bird lore. As a youngster, he was always catching and taming birds. And when he decided to quit the mad whirl in which he found himself back in 1936, he chose the wildest of the crop of domesticated fowl, Guineas, as his principal farm crop.

Gordon Gleason believed that scientific breeding and operation of a Guinea plant could not only be an interesting vocation, but a profitable one. And he has devoted the past seven years to proving that his theory is correct.

When he bought the 365 acres of Totem Farm at Meridale, Delaware county, in 1936, Guineas were practically unknown in that section. Today, Totem farm is undisputably the largest Guinea farm in the United States.

Mr. Gleason went into the field with his eyes open. He knew he was going to run into pitfalls; that to transform Totem Farm into a profitable operation would mean lots of work and little play.

He had known for some time

**Reprinted by permission from Better Farms, Pulaski, N. Y., Jan. 1, 1944**

that in peacetime Europe there were many large, scientific Guinea breeding establishments. It was his determination to establish here in America a Guinea plant which would not only rival but outstrip those of the old country.

What he has learned about Guineas in the past seven years has cost plenty. The tuition in his self - taught school was high. There were few guideposts and milestones; he groped some of the way—but he learned. He allows there's much yet to know and he's daily acquiring knowledge along scientific lines.

Beginning with 60 Pearl and 12 Blue Guineas in the spring of 1938, he had upward of 300 on hand by fall. In 1939, he began adding other varieties. Today he has every variety which can be successfully raised in the North, including Pearl, Silver Tipped (Pearls with white feathers), Lavender, Blue (also called Purple, Royal Purple and Bronze), Coral, Diamond, Violet, White (also called African White), and several crossbred varieties he is attempting to develop into a strain. Experience has told him that Vulturine and Reichnows cannot be raised in the New York state climate.

His sales have been high and profitable. Discounting 1943 as an off year, because help was almost nil and his stock materially reduced, he usually keeps 800 breeding birds, from which 5,000 chicks are raised and shipped to every state in the union and to foreign countries. Eggs are sold and dressed Guineas are marketed at prices ranging from 85 cents to a dollar a pound. Coral Guinea is noted for its fine flavor, large breast and white meat, and easily brings a dollar a pound from connoisseurs. Prime Guineas go direct to a high class trade supplied by catering restaurants, hotels and night clubs. The Guinea shortage was acute last year and quoted prices were at near - record peaks, 55 and 85 cents per pound, respectively, for old and prime birds. A prime Guinea broiler or roaster weighs from two to three pounds—and $3 is not considered an exorbitant price. In fact, it is doubtful if many can be bought at that figure.

Mr. Gleason allows he hasn't made a barrel of money at his interesting vocation—yet—but he's had a lot of fun, has learned a lot about the peculiar, shy creatures, and believes that when the war ends there will be a large demand for them both at home and abroad.

At present, experiments are under way at two universities to determine the place of Guinea fowl meat in the diet treatment of various diseases. His chief personal interest right now is to educate the public to the possibilities

of the breed. In recent years an increasing number of hotels and restaurants catering to discerning trade demanding Guineas on the menu, have been buying chicks or eggs and raising their own birds.

No special feed is given the chicks at Totem Farm, except the standard starting turkey mash, to which meat scrap is added in the ratio of one to five or six. When the birds are old enough to assimilate it, intermediate scratch grain is added to their diet with all the grit and charcoal they can eat. Oyster shell is not fed. Guinea's eggs have so hard a shell they often will not hatch when oyster shell is a part of the bird's diet. Adult birds get ground oats and meat scrap, six and eight of oats to one of meat scraps. The meat scrap ratio fed in winter is reduced in summer, when the Guinea, a great forager and destroyer of insects, picks up much animal matter. The mash is fed but once a day in hoppers, and at dusk comes the scratch grain. Adult birds get whole corn; the younger ones, cracked corn.

Fancy poultry houses are unnecessary, the Pearl, White, Lavender and Blue varieties being able to stand temperatures of 30 below zero and better. Corals, Diamonds, Azures, Violet and Lilac birds, however, have tender feet which freeze at 12 below. Diseases common to average poultry flocks are unknown in the Guinea coop. Neither are they susceptible to contagion or likely to become "carriers" when associated with other birds. They are the sentinels of the chicken roost, their hue and cry giving alarm at the slightest approach of any bird, animal or person, regardless of the hour. Hawks shun their presence, since Guineas have a salutary habit of pouncing upon such marauders whenever possible.

While Guineas often attack young rats, adult rodents, which always menace poultry flocks, are poisoned at Totem Farms. However, the Guineas' alarm so disconcerts rodents that they do not present the problem here that they do in ordinary poultry houses.

On the debit side of the ledger, Guineas, in hovers, at least, are difficult to raise because of their tendency to crowd and crush each other. Accordingly, Mr. Gleason keeps them in circular enclosures around the brooder stove, 25 to the enclosure. Oil, coal or wood-burning brooder stoves are a "must" in successful Guinea culture, since the entire brooder house in the early stages must be kept at an even 95-100 temperature, later being reduced, as in other chick breeding. The eggs hatch in from 26 - 28 days, depending upon the variety, the outstanding characteristic being that they require more moisture

than chicken or turkey eggs. At Totem Farm, before turning, they are sprayed with tepid water daily from the tenth to the twenty-fourth day. Hatching eggs are kept trayed in a cooler, at 50 degrees, and turned twice daily, and, when necessary, sprayed with water to increase the humidity.

During the breeding season the birds are left in outdoor runs enclosed in a five-foot high one-inch poultry mesh, buried two feet in the ground to prevent fox and coon inroads. Pens are separated by snow fence. One wing is cropped to prevent flying out. During the winter, all varieties are allowed to run with the chickens or turkeys, since they do not crossbreed. Birds mated the previous season pay no attention to other associates. Breeders are kept two years at Totem Farms, two hens to a cock bird, though one rooster to five hens is permissible when the flock is controlled. On range, the ratio of males to females is one to two, if eggs are hatched under hens, since the males guard the nests of their mates, and more than two nests to watch would be an impossibility, even for these remarkable birds.

There are many other interesting things about this odd Delaware county institution. Sixty-six of its 365 acres are under cultivation, 100 in woodlot, and the balance to pasture and orchard. Buckwheat is the principal crop of grain raised for the birds; the balance is purchased commercially.

# Calf Nutrition—Effect on Diseases

**Condensed from The Guernsey Breeders' Journal**

*Paul H. Phillips*

**Department of Biochemistry, University of Wisconsin**

WE now recognize that disease arises from at least two causes, bacterial infections and dietary deficiencies. Recent research has shown that many calfhood diseases can be traced directly to deficient diets. Defective diets for calves have arisen in two ways: First, we are feeding our dairy calves milk from cows that have been developed especially for milk production and in so doing the concentration of some of these dietary substances may have become greatly diluted; secondly, we have consistently attempted the use of milk substitutes in calf feeding without knowing fully what we needed to substitute. We now know that proper nutrition will prevent much of the scours, pneumonia, cold and navel infections in young calves.

Low levels of vitamin A and nicotinic acid in the diet are important causes of scours in calves. If enough of these are given to the calf, along with the usual calf ration, many of the common diseases of the calf will automatically disappear.

Calves are born deficient or lacking in vitamin A. They obtain their first supply of vitamin A from the colostrum, or first milk after calving. It is very important that calves get enough of the colostrum milk to supply this vitamin. It should be fed in reasonable amounts to the calves at any time it is on hand regardless of the age of the calf.

Colostrum milk is an excellent food and should not be wasted. It contains ten times as much vitaman A, three times as much vitamin D, two times as much ascorbic acid, and three times as much riboflavin as ordinary milk.

The symptoms of vitamin A deficiency in calves usually begin with "water eyes," cold in the head with a discharge from the nose, sometimes a cough, and scours—mild to begin with but severe if they continue. The calves suffer for three to ten days with this disease and then die from an acute case of pneumonia. Mild deficiencies in vitamin A are noted by general unthriftiness, a dead, roughened hair coat, and lack of growth.

Lack of this vitamin weakens the entire system and always

**Reprinted by permission from the Guernsey Breeders' Journal, Peterborough, N. H., December 15, 1948**

causes injury to the digestive organs, with scours as the result. For this reason vitamin A is needed by the calf.

New-born calves may have enough niacin in their bodies to supply their needs for the first few days. With this supply to start with and from the small amount found in milk, they manage to get along until the paunch begins to function. The bacteria of the paunch usually make all members of the vitamin B group, including niacin. Milk contains very little niacin and when the young calf needs extra amounts of this vitamin it must be obtained elsewhere.

Niacin is needed to keep the digestive organs working properly. Lack of this vitamin causes congestion of blood in the blood vessels and flabbiness of the muscles of the digestive tract. The absorption of vitamin A may therefore be interfered with. Thus the lack of niacin causes a digestive disturbance which results in scours.

Calves are born with large amounts of ascorbic acid (vitamin C) in their blood. However, most of this supply is used up in the first two or three days, and the calf must rely upon that which is in milk until it can begin to make this vitamin within its own body. This will require about three weeks. Ascorbic acid is very important in helping to ward off infection. In cases of pneumonia or inflammation of the navel, the ascorbic acid in the blood is reduced to very low levels. Giving ascorbic acid to the new-born calf helps it to control various types of these active infections. Serious cases of navel infection can be prevented or cured by giving ascorbic acid. It also helps greatly in overcoming calf pneumonia.

When calves show deficiency diseases they must be treated promptly. Many of the vitamins needed for treatment of young calves can now be purchased. If the diseases which have been described appear, then the following directions for the use of vitamins and vitamin feeds may be useful.

### Vitamins for Scours

*Vitamin A and Nicotinic Acid*

*Vitamin A*—Any 9,000-10,000 unit.

*Vitamin A Oil can be used.*

Obtain empty gelatin capsules size 00.

Fill these capsules with the vitamin A oil. An eye dropper is convenient for this purpose.

Give one capsule every other day for two to three weeks to prevent scours. (In order to raise good healthy vigorous calves, 3,000 to 5,000 units of vitamin A are required per day.)

If the calf is scouring badly give two capsules every day until the scouring stops.

NIACIN (*Nicotinic Acid*)

Use size 00 capsules as above.

Give a capsule 1-3 full of niacin when the vitamin A is fed.

The niacin can also be mixed with the vitamin A oil (above) and fed in one capsule if desired. In this case use a ¼ capsule of niacin and fill the remainder with the vitamin A oil.

To feed the capsules, place them on the back of the calf's tongue with the fingers. They'll take them readily.

ASCORBIC ACID* FOR NAVEL INFECTIONS

It can be fed until the calf is ten days old, *thereafter it must* be injected to be of any benefit.

Obtain size 00 empty gelatin capsules.

Give 1 capsule full of ascorbic acid every other day for first week or ten days of life.

In the case of enlarged navels give one capsule a day until improvement is noted.

*Where Can These Materials be Obtained?*

*Purchase through your feed dealer—Vitamin A oil.*

Any high grade vitamin A oil will supply vitamin A. Do not use an oil with guarantee of less than 9,000 units of vitamin A per gram.

*Purchase from your local druggist—Nicotinic acid and empty gelatin capsules.*

PRACTICAL FARM SUGGESTIONS

In most cases the methods outlined above will bring about the greatest response, in the shortest time. It is a good practice to keep these vitamins on hand to take care of the young calf. The vitamin A oil must be kept stoppered and in a cool place. Where the number of calves on the farm at any one time is small, it may be more convenient to resort to a few home remedies such as:

Give the new-born calf six pounds of colostrum milk for each 100 pounds of body weight within two hours after birth. Continue feeding this amount at 12-hour intervals as long as it is available. This supplies vitamins A, D, and C.

Feed the extra colostrum milk back to the dam the first day and distribute the rest among the other milk-fed calves until the milk is ready to save.

In the case of scours, break three or four fresh eggs into four pounds of milk, stir thoroughly and feed such a mixture for two or three days. This will supply vitamin A and since scours most often result from low vitamin A, it will control many cases of scours. Eggs are low in nicotinic acid and therefore they will not help if this factor is missing, hence eggs do not always give a 100 per cent response in the control of scours.

*Ascorbic acid is no longer available for this purpose until the war is over.

# First Calf Heifer Problems

**Condensed from The Ayrshire Digest**

IT is doubtful if any period in the life of the dairy cow is more critical than the first lactation. It is a well known fact that the entire future of a majority of heifers depends on their performance during the first few months of production. It is also true that entirely too many heifers are not ready for the trying task of heavy milk production. Man forgets that the heifer of not many generations ago had only the simple task of producing enough milk for her young; but nature does not forget. Unless all conditions are reasonably good, a heifer will produce as nature originally intended (plus the added extras due to the influence of her breeding) but not infrequently short of the amount her owner hopes for.

Quick decisions are being made in these times regarding the worth of first calf heifers and their sires. Either they *do* or they *don't*. Heifers are expected to make a good showing in their first lactation. In a majority of cases the future of their sires depends on the first lactation of his daughters. Regardless of the arguments against placing full confidence in a heifer's first opportunity, one cannot overlook the ruthless economic pressure that forces the low producers out of the stanchions, regardless of their age. In other words no matter what may be the arguments against culling or retaining heifers as well as evaluating their sires on first records, it will probably continue to be the prevailing custom because there is really no alternative in the majority of cases. In most breeding herds there will continue to be a higher percentage of first calf heifers than milking females of any other age.

At her best the immature heifer has a problem in producing enough to balance accounts for all charges that are suddenly placed against her as she takes her place in the milking string. If she has good breeding and is properly managed she may succeed. But unfortunately she may be one of the many well-bred heifers unprepared to go into her first lactation; and when further handicapped by unsatisfactory environment, she is almost certain to fail, regardless of her inheritance. Management affects dairy cows of any age, but heifers

Reprinted by permission from The Ayrshire Digest, Brandon, Vermont, Dec., 1943

are probably influenced by it to a much greater degree than older cattle.

First among the reasons why a heifer may be curbed by environment is the marked change when she enters the milking string. Nearly all heifers have lived almost exclusively on pasture and roughage during much of the year preceding their first calving. In contrast older females as a rule have been fed for milk production during the year preceding their calving. This in itself may make but little difference, but when a heifer has been on pasture right up to her first calving, she is usually in no condition to produce as she should. To further limit her production she will grow, and build bone and muscle during her first lactation. In fact nature provides that heifers may lose in weight but still gain in size. As a rule the urge to grow is stronger than the urge to milk. Obviously without a solid reserve upon which to start her first lactation few heifers will make a creditable showing on the milk sheet.

In addition the first calf heifer that calves in the summer and in thin condition has a double handicap placed upon her career. She faces all the disadvantages of short pastures, flies, irregular milking during the harvest season; and in addition the disadvantage of making her maximum production in a season of the year when butterfat tests are lowest.

A study of monthly butterfat tests on 4000 Ayrshires enrolled in the Herd Test during 1940 by Messrs. Bowling and Putnam shows their quarterly seasonal averages are as follows:

| | |
|---|---|
| Dec., Jan., Feb. .... | 4.11% |
| Mar., April, May .. | 4.05% |
| June, July, Aug. .... | 4.00% |
| Sept., Oct., Nov. ... | 4.09% |

In January the average test is 4.13% and in August the same cattle average 4.00%. The average Ayrshire produces about 40% of her 305-day record in the first three months. Suppose that she freshens on July 1 and is handicapped by low tests during the period of heaviest milk flow; the effect on her first record is bad and if she has half a dozen sisters calving at the same time, both they and their sire may be promptly "blacked-out." Unfortunately both these heifers and their sire may be genetically good, but condemned because of "working conditions."

But that isn't the only hurdle that the first calf heifer must clear. It is a well known fact that nature checks the milk flow of the dam as she comes closer to calving. But notwithstanding this truth it is not uncommon for cattlemen to promptly re-breed the heifer that may not be milking very well, and then plan to hastily

dry her off in anticipation of the second calving.

In these days when the performance of a group of heifers almost immediately reflects credit or discredit on their sire, it would seem as though seriously-minded breeders could hardly afford to blight the future of their sires by mismanaging their heifers. The Approved Sire plan is quite successfull in putting the stamp of approval on sires whose daughters have had at least a reasonably good opportunity, but no plan has yet been devised for detecting the many good sires that are lost to their owners and the breed because their daughters have been mismanaged. On the other hand for the heifer that calves in condition and is managed properly there is no excuse for low production except her inheritance.

Another costly problem in bringing first calf heifers into production is the carelessness with which sires are selected for the first mating. Not infrequently the statement is made, "Just a young bull to breed my heifers." Strange as it may seem, many breeders seem to have two standards for their herd sires; a high standard for the sire to which their cows are bred, and a much lower standard for the bull to which the heifers are mated. This is undoubtedly a costly double-standard. Since the average cow probably does not produce more than three or four living calves, it would seem as though a breeder can ill-afford to deliberately plan a mating in which the calf may be worth less than the dam at the same age. On the average the first heifer calf may represent from 33⅓ to 50% of the daughters born to her mother.

Full appreciation of this fact should in time result in a broad expansion of the market for the better young sires. It should also have a beneficial effect in raising the level of the offspring of first calf heifers. The fact remains that a certain percentage of the first daughters of first calf heifers remain in the herd.

Growing and developing young heifers so that they will be ready for business at an early age is within the reach of practically every breeder who can produce pasture and roughage of good quality, and who is willing to supplement these with reasonable amounts of concentrates.

## FOR THE FARMER'S LIBRARY

These books are recommended as outstanding in their field:

**A Living from Bees**—By Frank C. Pellett, Field Editor of American Bee Journal. Orange Judd Publishing Co., Inc. (1943). $2.00.

**America's Garden Book** — By Louise Bush-Brown and James Bush-Brown. Charles Scribner's Sons (1939). $3.50.

**Animal Sanitation and Disease Control**—By Dr. R. R. Dykstra, Dean of the School of Veterinary Medicine, Kansas State College. The Interstate Printers and Publishers. $2.85.

**Beekeeping** — By Everett Franklin Phillips, Professor of Apiculture, Cornell University. The Macmillan Co. $4.00.

**Beef Cattle** — By Roscoe R. Snapp, Asso. Prof. Animal Husbandry, Univ. of Illinois. John Wiley & Sons, Inc. $4.00.

**Beef Cattle Production in the South**—By D. W. Williams, Head, Department of Animal Husbandry, A. & M. College of Texas, College Station, Texas. The Interstate Printers & Publishers (1941). $2.00.

**Dairy Cattle and Milk Production**—By Clarence H. Eckles, B.S.A., D.Sc., late Chief, Div. of Dairy Husbandry, Univ. of Minnesota. The Macmillan Co. $3.90.

**Dairy Science**—By W. E. Petersen, Ph.D., Assoc. Prof. and Assoc. Dairy Husbandryman, Univ. of Minn. Edited by R. W. Gregory. J. B. Lippincott Company (1939). $4.00.

**Farm Shop Practice**—By Mack M. Jones, M.S., Prof. Agri. Engineering, Univ. of Mo. McGraw-Hill Book Co., Inc. $2.75.

**Feeds and Feeding**—By F. B. Morrison, Prof. of Animal Husbandry and Animal Nutrition, Cornell Univ. Morrison Press. $5.00.

**Farm Meats**—By M. D. Helser, B.S.A., M.S., Prof. Animal Husbandry, Iowa State College. The Macmillan Co. $3.25.

**Farm Management**—By Robert R. Hudelson. The Macmillan Co. $2.00.

**Farm Management and Marketing**—By V. B. Hart, Ext. Professor of Farm Management; M. C. Bond, Ext. Professor of Marketing; L. C. Cunningham, Ext. Asso. Professor of Farm Management; all of N. Y. State College of Agriculture, Cornell University. Publishers: John Wiley & Sons, Inc. (1942). $2.75.

**Farm Accounting**—By Donald R. Mitchell, Asst. Prof. Agri. Economics, Univ. of Wisc. McGraw-Hill Book Co., Inc. (1941). $2.50.

**Farm Records**—By John A. Hopkins, Ph.D., Asso. Prof. of Economics, Iowa State College. Iowa State College Press. $2.50.

**Forestry in Farm Management**—By R. H. Westveld and Ralph H. Peck. John Wiley & Sons, Inc. (1941). $3.00.

**Gardening for Good Eating**—By Helen Morganthau Fox, Gardener and Author. The Macmillan Co. $2.50.

**Grow Your Own Fruit**—By M. G. Kains, formerly with U. S. Dept. of Agriculture; Professor of Horticulture, Pennsylvania State College. Charles Scribner's Sons. $3.50.

**Home Vegetable Gardening**—By Charles S. Nissley, Extension Horticulturist in Vegetable Growing. Rutgers Univ. Press (1942). $1.50.

**How to Raise Rabbits for Food and War**—By Frank G. Ashbrook, Fish and Wildlife Service, U. S. Dept. of the Interior. Orange Judd Publishing Co., Inc. (1943). $2.00.

**Judging Dairy Cattle**—By Edwin S. Harrison, Professor of Animal Husbandry, Cornell University. John Wiley and Sons, Inc. $2.75.

**Livestock Judging Handbook**—By Julius E. Nordby, Asst. Prof. Animal Husb., Univ. Idaho, and W. Malcolm Beeson, Ph.D., Asst. Prof. Animal Husb., Univ. Idaho. The Interstate Printers. $2.60.

**Livestock Production**—By Walter H. Peters, Chief of the Division of Animal and Poultry Husbandry, Univ. of Minn. McGraw-Hill Book Co., Inc. $3.50.

**Plowman's Folly** — By Edward H. Faulkner. University of Oklahoma Press (1943). $2.00.

**Poultry Husbandry**—By Morley A. Jull, Prof. of Poultry Husbandry, Univ. of Maryland. McGraw-Hill Book Co., Inc. $4.00.

**Poultry**—By A. R. Winter, Asst. Prof. Poultry Husbandry, Ohio State Univ., and E. M. Funk, Asst. Prof. Poultry Husbandry, Mo. State Univ. J. B. Lippincott Co. $5.00.

**Pork Production**—By William W. Smith, Prof. of Animal Husbandry, Purdue Univ. The Macmillan Co. $3.75.

**Practical Poultry Management**—By James E. Rice, Emeritus Professor of Poultry Husbandry, and Harold E. Botsford, Extension Professor of Poultry Husbandry, both at New York State College of Agriculture. Fourth Edition (1940), John Wiley & Sons, Inc. $2.75.

**Practical Horse Breeding and Training** — By Jack Widmer. Charles Scribner's Sons (1942). $3.00.

**Repairing Farm Machinery**—By Ivan G. Morrison, Asst. Professor Agri. Education, Purdue University. The Interstate Printers & Publishers. $1.80.

**Sheep Production**—By Levi Jackson Horlacher, B.S.A., M.A., Asst. to Dean, Col. Ag. Univ. Ky. McGraw-Hill Book Co., Inc. $4.00.

**Sheep**—By Levi Jackson Horlacher, Prof. of Animal Husbandry, Univ. of Kentucky. The Interstate Printers and Publishers. $2.00.

**Soil Conservation** — By Hugh Hammond Bennett, Chief, Soil Conservation Service, U. S. Department of Agriculture. McGraw-Hill Book Company, Inc. $6.00.

**Some Common Diseases of the Horse**—By George R. Conn, B.S.A.H., D.V.M., Orange Judd Publishing Co., Inc. (1942). $1.50.

**Some Common Diseases of Cattle**—By George R. Conn, B.S.A.H., D.V.M. Orange Judd Publishing Co., Inc. (1942). $1.50.

**Soybeans—Gold from the Soil** — By Edward Jerome Dies. The Macmillan Co. $1.75.

**The Home Veterinarian's Handbook**—By E. T. Baker, Veterinarian, Moscow, Idaho. The Macmillan Company (1943). $2.50.

**The Farm Primer**—By Walter Magnes Teller, formerly with the Farm Security Administration, U. S. D. A. David McKay Co. $2.50.

**The Western Horse**—Its Training, Type and Marketing. By John A. Gorman, Asso. Prof. Animal Production, Univ. of Wyoming. The Interstate Printers and Publishers. $1.65.

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